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Editorial

At a recent meeting of the Royal College of Surgeons of England, Dr. Gordon Murray, of the Department of Surgery, was elected Hunterian Professor. This honour was given in recognition of Dr. Murray's work in collaboration with Professor C. H. Best, on the use of heparin in thrombosis.

This is the second time such an honour has been paid this University, the first time being when Professor W. E. Gallie was elected in 1923 for his work on the use of fascial transplants in repair of anatomical defects.

This professorship is named in honour of John Hunter, the founder of the science of surgery. Hunter lived in the era preceding the French Revolution and in fact died on the same day, perhaps hour, that Marie Antoinette, the unfortunate Queen of France, was beheaded in Paris. This era besides being the incubation period of political freedom was also the incubation period of the science of surgery.

Before Hunter's time a good knowledge of anatomy was deemed all that was necessary for the practice of surgery. All surgical treatment was empirical and there was little attempt to find the underlying cause of surgical disease. Hunter, however, applied his keen powers of observation and by observing phenomena recurring repeatedly under standard conditions, established definite principles of surgical practice.

Although he acknowledged the essential nature of facts he stressed that they must be coordinated as "a multitude of facts overcrowd the memory without advantage if they do not lead us to establish principles by an acquaintance with which we learn the causes of disease."

His method of approach to a surgical problem is well exemplified by his treatment of a case of popliteal aneurysm at St. George's Hospital. At this time the recognized treatment was either to cut down on the aneurysm, tie the artery off above and below and remove the aneurysm, or amputation of the leg above the aneurysm. Previously to this, among his many experiments, Hunter had attempted to influence the rate of growth of a deer's antler by tying off the main artery to the budding antler. In spite of this the antler continued to grow and Hunter saw that the collateral vessels had taken over the function of the main artery. He applied this experimental fact by cutting down on the femoral artery in its fibrous canal in the middle third of the thigh, ever since known as Hunter's canal, tying off the artery and leaving the aneurysm untouched.

The same phenomenon occurred as in the deer's antler and the man walked happily out of the hospital a few weeks later.

From this it can be seen that Hunter was not a surgeon who glorified in feeling flesh underneath his knife. He aimed to diminish the frequency and severity of surgery which he likened to "the acts of an armed savage who attempts to get that by force which a civilized man would get by stratagem." Such a description hardly applies to modern surgery with anaesthesia and asepsis but the principle still holds.

Hunter had a passion for collecting and during his life time gathered many physiological and pathological specimens. After his death they were offered for sale to the British Government. Pitt, who was busily occupied fighting Republican France, exclaimed at the offer, "What, buy preparations! Why I have not money enough to purchase gunpowder!" Eventually the Government purchased the collection and they were placed under the care of the Company of Surgeons who in 1800 became the Royal College of Surgeons. This collection forms the nucleus around which their famous museum has developed.

Hunter had many famous students among whom were Astley Cooper and Jenner. When Jenner wrote regarding his theories on vaccination Hunter replied in a characteristic manner, "Don't think, try; be patient, be accurate."

This spirit of John Hunter is reflected in modern surgery and makes us appreciate why a Hunterian professorship is regarded as a great honour. We offer our congratulations to Dr. Murray.

Professor Marrian

This month the Faculty of Medicine loses one of its outstanding men in the person of Professor Marrian. Commencing in January, Professor Marrian will occupy the chair of Chemistry in Relation to Medicine at the University of Edinburgh.

For many years Professor Marrian has done research on the sex hormones and his work has gained him international recognition. To us at the University of Toronto, besides being known as a brilliant worker in his own field, he is known as an excellent teacher. His kindly advice as a member of the Advisory Staff of the Journal has been greatly appreciated.

We are sincerely sorry to see Professor Marrian leave and we wish him every success in his future undertakings.

The Royal College of Physicians and Surgeons of Canada

The ninth annual meeting of the Royal College of Physicians and Surgeons of Canada was held at Ottawa recently. Contributions were made to the Scientific Session by Professor Boyd on "Some Etiological Factors in Cancer" and by Dr. E. W. Archibald and Sir Frederick Banting on "Various Aspects of Cancer Research."

The announcement was made that twenty-eight candidates were successful in passing the Primary Examinations and eleven the Final Examinations to qualify for Fellowship.

Our congratulations are extended to the successful candidates, especially those from this University.

HYPOPARATHYROIDISM AND TETANY—(Part II)

By R. F. FARQUHARSON, M.B., F.R.C.P. (C).

CALCIUM METABOLISM IN PARATHYROID TETANY

The characteristic changes in calcium metabolism in parathyroid tetany are: (1) a lowered serum calcium — usually between 5 and 7 mg. per 100 c.c.; (2) an increase in the serum inorganic phosphorus, commonly to over 5 mg. per 100 c.c.; (3) a diminished excretion of calcium and phosphorus in the urine. This is well illustrated in Figure 1 where values for serum calcium and phosphorus and the urinary and faecal excretion of calcium of a patient with chronic parathyroid tetany are contrasted with those of a control patient receiving the same diet. One is struck by the approximation of the curves representing serum calcium and inorganic phosphorus in the patient with tetany whose urinary excretion of calcium (represented by the cross hatching) is much lower than the normal. These findings are just the opposite of those occurring in hyperparathyroidism where the serum calcium is greatly increased and the serum inorganic phosphorus diminished, while the excretion of calcium salts in the urine is much greater than normal.

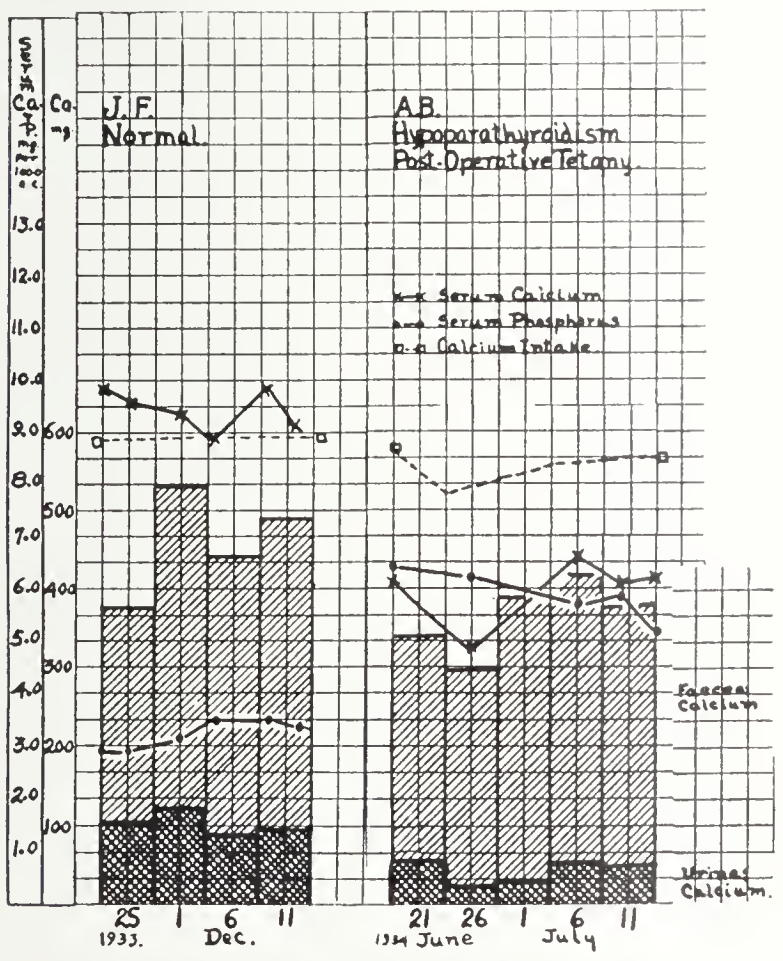

Fig. 1. Calcium metabolism in J.F., a control patient, and in A.B., a case of post-operative parathyroid tetany. Both patients took a constant diet of approximately 600 mg. calcium daily.

The severity of the symptoms in parathyroid tetany does not depend exactly on the lowness of the serum calcium nor on the increase in the serum inorganic phosphorus. In general, the low calcium level is more constantly related to the degree of tetany than is the elevation of the serum phosphorus, although there is a lack of complete parallelism with either. For instance, tetany may be far more severe in a patient whose serum calcium is 7 mg. per 100 c.c. than in another whose serum calcium is 5 mg., the serum phosphorus also being more abnormal (i.e. higher) in the latter case. Even in the same individual, changes in symptoms do not exactly parallel variation in the serum calcium level, although on the whole there is a tendency to do so. Usually for a given concentration of calcium in the serum the symptoms are more severe in the early stages of the disease than at other times. It would appear that the body partially adjusts itself to the low serum calcium, for one often finds patients carrying on in relative comfort whose serum calcium is as low or lower than it was when formerly severe crises of tetany occurred.

Experience would indicate also that there is great individual variation in the sensitivity of the nervous system to the factors that cause tetany. Thus, highly strung, tense, nervous patients, especially those with hysterical tendencies, may have symptoms and signs of tetany when under similar conditions

more phlegmatic individuals remain unaffected.

It is possible that the severity of the symptoms varies inversely with the number of calcium ions in the body fluids. At present, unfortunately, there is no clinical method of measuring the calcium ion concentration. On the whole, however, symptoms become mild or disappear when the serum calcium rises above 8 mg. per 100 c.c. and in severe crises the serum calcium is almost always less than 6 mg. per 100 c.c.*

Differential Diagnosis

The diagnosis of parathyroid tetany is obviously easy when symptoms appear after a subtotal thyroidectomy. Moreover this is the commonest type of chronic tetany in adults. Spontaneous parathyroid tetany is to be recognised by the gradual onset of the syndrome in a patient with a low serum calcium and high serum inorganic phosphorus in the absence of any of the nutritional disorders commonly associated with tetany.

Tetany associated with nutritional disturbances may be differentiated by recognising the symptoms and signs of the accompanying disease, notably: the presence of rickets in infants; changes in the bones in osteomalacia; the history of deficient diet in both the above conditions; the presence of large fatty stools in sprue and steatorrhoea. As in parathyroid tetany, the serum calcium is low, but the serum phosphorus instead of being increased is commonly low.[7, 8, 9] In the absence of a history of previous thyroidectomy any doubt about the diagnosis will disappear when the tetany ceases promptly in response to appropriate treatment of the nutritional disorder.

Tetany associated with alkalosis is usually transient and, unlike the former types, almost never chronic. It is easy to recognise gastric tetany by its appearance only after repeated vomiting. Similar tetany may be seen in partial or complete intestinal obstruction. It is important to remember, however, that such conditions may be recurrent and also that patients with parathyroid tetany may have spells of vomiting which, as mentioned before, greatly aggravate the symptoms. A carefully taken history usually leaves no doubt about the diagnosis. The serum calcium, moreover, is normal in gastric tetany in contrast to the hypocalcaemia of parathyroid tetany, whereas the CO_2 combining power of the serum is increased.

Tetany from overbreathing[10, 11, 12] like gastric tetany, is usually transient but also may be recurrent. As in gastric tetany, the serum calcium and phosphorus are normal. It appears in nervous and hysterical patients, especially when afraid or under strain or when minor operations on teeth or nose and throat are being performed. Under such conditions the sudden onset of intense paraesthesia, with or without spasm, may be very terrifying to the patient and attendants but the situation is relieved when the condition is recognised and properly explained. One may observe the syndrome in patients breathing rapidly with acute upper respiratory disease in whom a short inspiration is followed by full expiration and the blowing off of carbon dioxide. It also may be found in patients overbreathing as a result of cerebral disease.

Trophic Changes in Tetany

The occurrence of cataracts in patients with chronic tetany, as well as in parathyroidectomized animals, has been noted even in early descriptions of the disease. They are often associated with changes in the hair which may become coarse and dry and sometimes falls out repeatedly. Similar shedding of the nails has been described but is uncom-

*Changes in the protein and CO_2 combining power of the serum could account for a certain variation in calcium level without change in calcium ion concentration. Actually, however, in patients with parathyroid tetany, serum protein and CO_2 combining power are relatively constant.

mon. Rather more frequently, the nails may be unusually ridged and brittle. Enamel defects in the teeth have also been described.

Of the 24 cases of parathyroid tetany treated at the Toronto General Hospital since 1926, there were 7 in whom gross cataracts developed so that extraction became necessary, and 2 others with well developed cataracts pending operation. In 6 of these cases tetany had been unusually severe at the onset and in all, failure of vision was noted within a year of the operation. The serum calcium in this group has been constantly low and now, after extraction of the cataracts, it persists at a level distinctly lower than that of most of the patients in whom there was no failure of vision. In the 6 cases still under observation, its level varies usually between 5 and 6 mg. per 100 c.c. It is noteworthy, however, that the symptoms of tetany, so severe at the onset in all 6 cases, are now comparatively mild in spite of the low serum calcium.

Change in texture of the hair was quite marked in 2 of the patients with cataract as well as in 3 of the other cases. The hair became dry and coarse and fell out in quantities. In one patient it has been shed several times. These changes in the texture and thickness of the hair have occurred in the absence of any general myxoedematous tendencies but it is, of course, difficult to rule out completely the influence of some degree of hypothyroidism.

We have not noted shedding of the nails in any case, although in some patients the nails have become brittle with increased longitudinal ridging. Nor have we recognised any characteristic changes in the teeth.

The occurrence of cataracts and other trophic changes has been observed in patients of various ages suffering from chronic tetany associated with rickets and osteomalacia as well as in cases of parathyroid tetany.[4, 13, 14] Probably the important aetiological factor is the persistence of a low serum calcium over a long period of time. This belief received further confirmation from Kirby[14] when, in studying lens epithelium in vitro, he observed degenerative changes whenever the calcium content of the nutrient fluid was reduced.

The cataracts of tetany may be either central or perinuclar. Sometimes they cease to progress, lenticular opacities visible with a slit lamp, remaining unchanged in patients who have noticed no failure of vision. In general they are essentially similar to senile cataracts and require the same treatment.

Prevention of cataract. The development of cataract is obviously a serious complication of tetany and its prevention, therefore, most desirable. Salveson[15] advised persistent administration of calcium salts, stating that tetany may appear in a short time if the calcium is reduced or discontinued. Unfortunately in our hands such therapy has not been efficacious. Cole[13] hoped to prevent cataract by the administration of 20 to 40 units of 'parathormone' daily in addition to a liberal intake of calcium. The administration of parathyroid hormone, however, often ceases to be effective in maintaining a normal serum calcium. In recent years, as will be described presently, we have been able to maintain a higher serum calcium over long periods by the daily oral administration of large doses of irradiated ergosterol and it is suggested that such treatment be given to severe cases of parathyroid tetany with the hope that the development of cataracts may thus be prevented. Similar results have been obtained by the administration of dihydrotachysterol. In one of our patients with a very low serum calcium, cataracts appeared within a few months of operation and were progressing rapidly till large doses of irradiated ergosterol were given. She has continued to take approximately 50,000 international units of vitamin D daily in the form of irradiated ergosterol for almost two years. On this therapy the serum calcium has persistd at a slightly subnormal level, the symptoms of tetany have largely been con-

trolled and the cataracts have not progressed.

Treatment of Parathyroid Tetany

In the *acute attack*, whether at the onset or at any time in the course of the disease, the parenteral administration of soluble calcium salts will give quick relief. One may give 10 c.c. of a 5 or 10 per cent solution of calcium chloride, giving it slowly and taking care that none of the solution passes into the tissues about the vein where it might cause a slough.* The patient feels a sense of warmth all over the skin while the calcium chloride is being given; muscles in spasm relax, paraesthesiae disappear, and a feeling of greater well-being returns at once. Although the serum calcium quickly falls to a low level after such treatment, the patient will often feel better for hours and even for days afterwards.

When severe spasms recur the intravenous administration of calcium chloride should be repeated. If, however, attacks recur repeatedly or if tetany becomes almost constant in spite of the ingestion of a diet rich in calcium with added calcium salts, then the intramuscular or intravenous administration of parathyroid extract in doses of 20 to 50 units per day is indicated. There follows a gradual rise in the serum calcium with relief of the symptoms of tetany. In an emergency, parathyroid extract is not so effective as is the intravenous administration of calcium chloride. But because the high level of calcium in the serum is sustained for hours and because it may be maintained for considerable periods by a daily dose, it is a valuable form of therapy at any time when severe attacks are recurring frequently.

Unfortunately parathormone is expensive and, moreover, it may cease to be effective in raising the serum calcium and, indeed, may become quite useless when its administration is continued over long periods of time. It should, therefore, be used only as a temporary measure during periods of frequent severe attacks. The dose should be the smallest that will give the desired effect. During the period of its administration the diet should be rich in calcium and calcium salts should be added because ingestion of large amounts of calcium augments the effect of parathormone.

Chronic Tetany. In all cases and at all times the patient should be given a high calcium diet—one quart of milk daily, abundance of eggs and leafy vegetables—augmented by the ingestion of calcium salts. Calcium chloride in doses of 20 to 45 grains, given always with food three times a day, is of great value. Being potentially an acid salt, it is more effective in relieving tetany than is calcium lactate or calcium gluconate which have, however, the advantage of being more easily taken and less apt to upset the stomach. If calcium lactate or gluconate be used, doses of 30 to 60 grains three to six times a day may fail to produce the same effect as the smaller dose of calcium chloride. Many patients are almost completely relieved by such calcium administration which forms the basis of all treatment. In some cases the dose of calcium chloride or lactate may be reduced while the patient continues to take a high calcium diet. In others, it may be necessary to give, in addition, calcium chloride intravenously or to use parathormone from time to time.

The use of Irradiated Ergosterol. In any disease characterized by a disturbance of calcium metabolism, it is obvious that an adequate amount of vitamin D must be given in the diet. Tetany associated with rickets or osteomalacia is cured by the ingestion of the ordinary doses of vitamin D. It was natural that irradiated egosterol should be tried in varying amounts in treatment of patients with severe chronic parathyroid tetany. A number of authors have reported unsuccessful results with this form of therapy, but most of them have given the ergosterol

*If the gluconate is used, 10 c.c. of a 10 per cent solution may be given either intravenously or intramuscularly.

in relatively small doses. Using very large amounts of irradiated ergosterol over a short period, Bauer, Marble and Claflin[16] were able to demonstrate an increase in the serum calcium to normal with relief of tetany in two cases of spontaneous and in one case of post-operative parathyroid tetany. Following their work, an attempt was made in the clinic at the Toronto General Hospital to find the smallest daily dose that would relieve the symptoms of two patients suffering from severe chronic post-operative tetany which had been refractory to other forms of treatment.* The dose was increased at intervals of three weeks and finally the serum rose to normal and all symptoms of tetany disappeared. These two patients received repeated courses of such treatment over a period of two and one-half years and one of them has since been maintained virtually free of symptoms on continuous large doses of irradiated ergosterol for over three years. Large doses of irradiated ergosterol have been given to a number of other patients over prolonged periods with good results.

Recently the same beneficial effects have been obtained from the administration of dihydrotachysterol (½ to 1 c.c. daily)[17 18]. The dose of either of these sterols should be the smallest amount that will affect the desired result. In some cases relief may be obtained by an amount insufficient to raise the serum calcium to normal although sometimes associated with an increased excretion of calcium in the urine. Such dosage may be continued for many months with no harmful effects. One of our first patients was a woman of seventy years of age. She consistently became free of tetany and remained well while taking a daily dose of irradiated ergosterol equivalent to 10 c.c. of commercial viosterol. On several occasions its administration was discontinued and always fairly severe chronic tetany recurred after from one to four weeks. The administration of this amount would bring her serum calcium to between 8 and 9 mg. per 100 c.c. and give almost complete relief from the symptoms of tetany, but it required from two to four times as much to keep her serum calcium constantly above 9.5 mg. In the past four and a half years she has taken it continuously except for one period of a month or two during which time symptoms of tetany recurred. In spite of her age there are no signs of advancing arterial disease. Indeed, she looks younger than she did in the winter of 1932 when treatment with irradiated ergosterol was begun.

Similarly, Reed and Seed[19], reported the effect of repeated administration of large doses of irradiated ergosterol to patients with post-operative tetany, usually for short periods, and always followed by relief of the symptoms. When very large amounts of ergosterol were given, some of their patients suffered from headache, general malaise, nausea, vomiting, and anorexia but these symptoms soon disappeared on reducing the dose or discontinuing it.

The effect of daily ingestion of large doses of irradiated ergosterol on the serum calcium and phosphorus of a patient suffering from chronic post-operative parathyroid tetany with well developed cataracts is shown in Figure 2. From November, 1932, till May, 1933, this patient was given 94,000 international units of vitamin D daily. Over a period of two weeks her serum calcium rose to normal level while the serum inorganic phosphorus fell. At the same time the amounts of calcium excreted in the faeces was diminished and the urinary output of calcium increased. After cessation of administration of irradiated ergosterol the serum values gradually returned to their initial level over a period of several months and symptoms and signs of tetany recurred.

Large doses of irradiated ergosterol or of dihydrotachysterol must be used with great care, watching for the signs

*Meade, Johnson & Co. have very kindly supplied the concentrated solutions of irradiated ergosterol, thus making it possible to carry on this work.

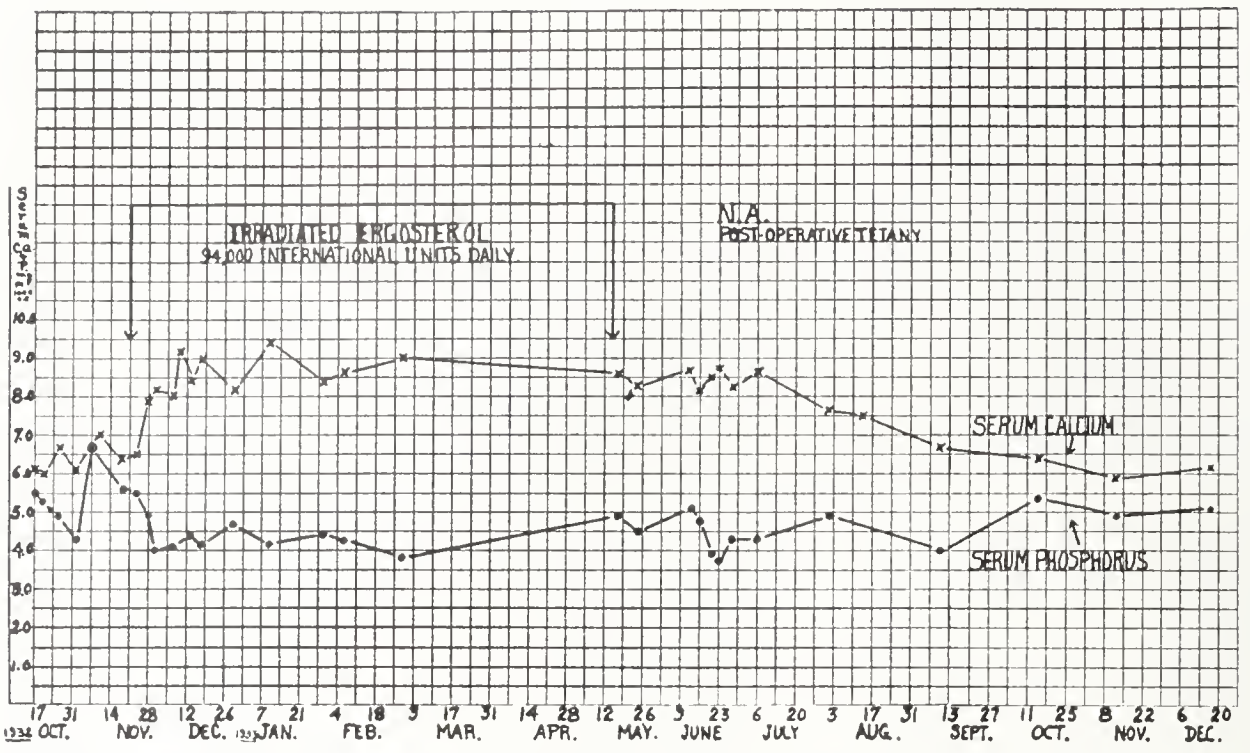
IRRADIATED ERGOSTEROL
94,000 INTERNATIONAL UNITS DAILY
N.A.
POST-OPERATIVE TETANY
SERUM CALCIUM
SERUM PHOSPHORUS
17 31 14 28 12 26 7 21 4 18 3 17 31 14 28 12 26 9 23 6 20 3 17 31 15 27 11 25 8 22 6 20
1933 OCT. NOV. DEC. 1934 JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.

Fig. 2. Effect of administration of 94,000 International Units irradiated ergosterol (equal to 10 c.c. commercial viosterol) daily for six months on the serum calcium and phosphorus of a patient suffering from chronic post-operative parathyroid tetany.

of overdosage (anorexia, vague abdominal pain, headache) and carefully following the levels of serum calcium and phosphorus. At the same time administration of calcium salts by mouth should be continued. One hopes by this means to be able to relieve severe tetany in individuals refractory to other forms of therapy and to prevent the occurrence of cataract in those patients with very low serum calcium. It would appear to be wise always to use the smallest dose that will give the desired result.

The Care of the Patient

One should pay careful attention to the patient's mental and physical state. As already mentioned, malnutrition, infection, fatigue, worry and unhappiness all aggravate the condition. Fortunately a high calcium diet, rich in dairy products and leafy vegetables is likely to lead to a good state of nutrition as well as aid in preventing tetany. If there is hypothyroidism, adequate doses of desiccated thyroid—usually 1 to 2 grains—should be given daily. Definite foci of infection should be removed. Patients with tetany need encouragement and interest as well as abundant rest in quiet environment and sleep. Whenever possible the patient should continue at her ordinary duties. Even a part time occupation or any interest is helpful. Patients with tetany have a tendency to become introspective, discouraged and depressed. The physician may do much to prevent and relieve such states by an active interest in his patient and by encouragement. Explanation, to give her a sensible understanding of the condition, is important. The temporary administration of bromide (6 grains three or four times a day) with or without a small dose of phenobarbital (¼ to ½ grain) is helpful at times.

Summary

Hypoparathyroidism, usually following upon a subtotal thyroidectomy, but also occurring spontaneously, gives rise to a state of chronic tetany, the result of characteristic changes in calcium metabolism. Serum calcium is low, serum inorganic phosphorus is increased and the excretion of calcium salts in the urine is diminished.

The syndrome of tetany is characterized by spasm of certain muscles, characteristic paraesthesiae, general weakness and fatigue, psychic changes, a tendency to cataract formation and, less strikingly, trophic changes in hair, nails and teeth.

Treatment in the chronic case consists in the administration of a well balanced diet rich in calcium with added calcium salts. In crises, calcium chloride or gluconate must be given intravenously and where acute attacks are recurring frequently, parathyroid extract in doses of 20 to 50 units daily

should be given for short periods.

The daily administration of dihydrotachysterol or large doses of irradiated ergosterol is of value in the treatment of patients whose tetany is refractory to other forms of therapy. It would appear to be effective in the prevention of cataract. Such therapy is expensive and not free from danger. It should be used with care only when other measures fail.

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ORGANIZED MEDICINE IN ONTARIO

A. D. KELLY, M.B.,

Secretary Ontario Medical Association

"Two Scots, a Caledonian Society; two Englishmen, a Club."

This well-known saying might be amended by adding, *"Two Doctors, a Medical Association."* The tendency for physicians voluntarily to band themselves together for professional advancement and mutual protection, has been evident for a very long time. Local groups of practitioners whose primary aim is to acquaint themselves with the latest developments in Medicine, special societies made up of Doctors interested in particular branches of the healing arts,—these constitute the building stones which make up the structure which we know as "Organized Medicine."

Organized Medicine represents the interests of all branches of our profession; the vast body of general prac-

titioners, the specialists in every field, the laboratory workers, the employed physicians, the men in Public Medical services,—in fact it is the medium through which the Doctors speak. Large provincial and national organizations are meant when one uses the term, "Organized Medicine," in this country. The words are used with several shades of meaning, depending on the relationship of the speaker to the Medical Association. Politicians, who have been thwarted by the collective will of the medical profession, have been known to use the term, "Organized Medicine," almost as an epithet, with the same fine scorn which used to be applied to the Trusts of Wall Street. On the other hand, when an after-dinner speaker recalls the humanitarian efforts and the activities in the public interest performed by medical associations, he is apt to clothe the phrase, "Organized Medicine," with a meaning which suggests that the members thereof are altruistic supermen. Organized Medicine is neither a wolf nor a lamb. It is a body of educated men who freely associate themselves to advance the interests of their profession, and to contribute their special knowledge to the solution of public problems which impinge upon their field.

Fifty-eight years ago, in 1880, a group of farseeing medical men, representing the relatively few active local societies in this province, formed the Ontario Medical Association. For many years the activities of the Association were confined largely to the holding of annual meetings. Membership in the organization was not continuous, and the small fee was levied only upon those who attended the annual gatherings. In 1918, it was decided that the time had arrived for a complete reorganization and, from that date, great progress has been made. The Association was incorporated by Letters Patent in 1921, with the following objects,—

(a) To cultivate the science of medicine and surgery;

(b) To advance the character and honour of the medical profession;

(c) To further unity and harmony among its members;

(d) To insure the observance of legal duties and obligations imposed on the profession in medical matters by the different statutes of the principles of ethics to be established by the Association;

(e) To promote the public health;

(f) To elevate the standard of medical and nursing education, both undergraduate and postgraduate;

(g) To assist in the advancement of medical legislation for the good of the public and the profession.

With the energy, enthusiasm and hard work of outstanding Doctors in every section of the Province, the Association has become an active force which operates for the benefit of the profession and the public in a multitude of ways. Growing from the thirteen affiliated medical societies in 1918, there now exist fifty active county and district societies, all of which are represented on the governing bodies of the Ontario Medical Association.

The activities of Organized Medicine, as represented in this Province, by the Ontario Medical Association today, may be broadly classified as Educational, Legislative, and Economic.

In the first category, the outstanding educational activity is the provision of postgraduate lectures to Doctors in their own localities. Every affiliated society is entitled to four speakers on scientific and clinical subjects per year, the expense being borne by the Association. The secretary of each society is provided with a schedule which lists five hundred and eighty topics, and arrangements are made through the Central Office to provide a suitable speaker. Our lists include the names of the outstanding authorities and the leading practitioners who find time in their busy professional lives to address their colleagues wherever they are located. In addition, there is held each autumn, in each of the eleven Districts of the Province, one-day meetings,

which are essentially brief postgraduate courses. The Annual Meeting of the Association provides not only a week of outstanding medical and surgical papers presented by the appropriate representatives in their respective fields, but exemplifies a relatively new departure in medical teaching,—the scientific exhibit. This graphic method of demonstrating the results of treatment or the progress of scientific investigation has become an important adjunct of our educational programme. Education by the printed word is not overlooked, because in the Canadian Medical Association Journal, the profession of this country has one of the best monthly medical publications in existence. In a more restricted and somewhat different field, the Bulletin of the Ontario Medical Association keeps the medical men of this Province informed on the activities of the Association and its component parts, and presents news of a medico-political nature.

In the field of Legislation, the Association works through a Joint Advisory Committee, with the other bodies which represent different phases of medical opinion, namely the College of Physicians and Surgeons of Ontario and the representatives of the three medical schools of this Province. The Medical Act, which governs the practice of medicine in Ontario and which is believed to be the best medical legislation to be found in Canada, owes a great deal of its present form to the advice and constructive suggestions made to the Government in the name of the whole profession. The Workmen's Compensation Act, at its inception and on several occasions since, has been modified to make it better fitted to perform its task as a result of representations made by the Association. The Pharmacy Act of this Province has been changed in relation to the better control of narcotics and the standardization of drugs with the assistance of representatives of organized medicine. The constantly recurring demands of the cultists who are registered under the Drugless Practitioners' Act, for increased privileges have been successfully combatted by the profession, working through the Joint Advisory Committee. The right to use the title "Doctor," to sign birth and death certificates, to practise in the public hospitals, to utilize the public health laboratories,—all these have been the subject of repeated attempts by these inadequately trained individuals to obtain for themselves by legislation. The medical profession has steadfastly maintained that no "back door" methods of entry to the practice of the healing arts should be permitted. We have declared that the public interest demands the preservation of the ability to distinguish between a legally qualified medical practitioner and an adherent of the manipulative cults by confining the use of the word "Doctor" as an occupational designation to the former. The Association has been consulted during the time of framing of Regulations under the Public Hospitals Act and, in many other important aspects of legislation affecting the health of the people. The Association has enjoyed the confidence and cooperation of successive Governments of this Province because it has been recognized that the opinions of the medical profession are correlated and expressed in the best interests of the public and the profession through this medium.

For many years, the major economic function of the Association related to the establishment and revision of a schedule of fees for medical and surgical services performed in private practice. This is still an important feature of our work which receives the attention of a standing committee. The Courts of the Province recognize this tariff as a standard and uphold the items specified as minimum charges. With the introduction of the Workmen's Compensation Act, organized medicine began to concern itself with the remuneration to Doctors paid not by the patient but by other agencies. The widespread economic depression which made itself felt in 1930 threw

upon the medical profession an intolerable burden in the form of an enormous increase in work done without hope of remuneration. Doctors since time immemorial have prided themselves on the fact that the poor and needy are cared for with the same attention afforded the more affluent members of the community. This medical care was never withheld, but gradually more and more practitioners found that the major portion of their time was devoted to unremunerative work and, if medical practice was to continue, some solution to the problem had to be found. The physical needs of the victims of the depression had been supplied in the form of relief and the task of organized medicine was to convince municipal and provincial governments that the medical care of the unemployed and their families was just as necessary and as much a duty of the state and the profession, as was the supplying of food, clothing and shelter. This proposition was finally admitted in principle by the Government, and legislation was passed permitting municipalities to provide a limited amount of medical relief with financial assistance by the Province. The permissive character of this legislation resulted in its very inadequate application. Chaotic conditions naturally resulted when one municipality granted this medical relief and its neighbour refused to participate. Administration by provincial and municipal authorities proved a task beyond their capacity and, finally, the Minister of Public Welfare called into conference the Officers of the Ontario Medical Association to discuss the entire problem of supplying medical care and medication to relief recipients. The result was the passing of an Order-in-Council on March 1st, 1935, vesting in the Ontario Medical Association the responsibility of supplying such medical services, and providing for the payment by the Government to the Association of a fixed sum of money per month in respect to every relief recipient in every municipality or unorganized area. It was a matter of pride to the Ontario Medical Association that organized medicine in this Province should so merit the confidence of the Government that this unique arrangement was possible. It is still a matter of pride that we have distributed funds in excess of one million dollars annually to the satisfaction of the Government, the relief recipient and the participating physician. It should be made clear that medical service under this scheme is restricted to office calls, home calls, and obstetrics in the home. Doctors are not being paid in full for this work, as their accounts show that about fifty per cent of this service and all the care of these people in hospital, is still being rendered gratuitously. Nevertheless we have learned to administer, on a large scale, a plan of medical service, and have proved to the satisfaction of all concerned, that such administration is only possible by organized medicine. We feel that this augurs well for the future control of medical problems in which the Government may be involved.

The Ontario Medical Association has, for many years, studied the problem of supplying medical care to large sections of the population by means of what may be broadly termed "Health Insurance." This problem has been approached with an open mind and the reports of successive committees have presented to the medical profession much valuable information. The studies conducted may be briefly enumerated:

(1) A survey of social and economic factors relating to present-day practice.

(2) An outline and analysis of typical State Medical Service schemes in various countries of the world.

(3) A questionnaire to the Doctors by which the profession overwhelmingly declared their approval of the principle of Health Insurance and gave encouragement to further study, and guarded leadership of the movement.

(4) An outline of a plan for Health Insurance for the Province of Ontario.

(5) An intensive study of the 1934

Report on Health Insurance of the Canadian Medical Association's Committee on Economics and recommendations for its revision.

(6) An introductory study of contract practice.

(7) A setting forth of the principles of *Voluntary* Health Insurance for the guidance of affiliated societies or others interested in establishing a local scheme.

(8) A survey of the available literature on the Cost of Medical Care in Canada, United States, and elsewhere.

The need for a plan for the provision of a complete medical and hospital service for individuals of limited income has been appreciated by the Ontario Medical Association. In anticipation of the institution of such a plan by governmental agencies, the Association has prepared a detailed outline of a service on a compulsory and contributory basis which we believe is adequate and fair to all parties concerned. It has not been the policy of the Association, however, to advocate the institution of compulsory health insurance until public and governmental opinion has indicated that it is desired by the people. When and if such a time arrives, the organized medical profession of Ontario is prepared to cooperate with the government and stands ready to administer the medical services.

Realizing that the actual cost of providing a complete medical and hospital service under the conditions existing in this Province can only be determined by the operation of such a scheme, the Directors and the Council of the Association approved of the request of three branch societies for assistance in the establishment of a plan for the voluntary prepayment for medical services in their respective areas. The Directors authorized the loan of $5,000 of Association funds to the Health Insurance Committee to assist in the inauguration of the proposed voluntary plan. An incorporated body known as the Associated Medical Services Incorporated was set up with a Board of Directors composed of physicians and laymen to arrange for the services required in the prevention and treatment of illness on a non-profit, prepayment, and voluntary basis. This corporation is quite distinct and separate from the O.M.A. but the Association is vitally interested in the success of the venture and expects that valuable information will be gained from this experiment in medical economics.

The Associated Medical Services is in operation in several areas of the Province in addition to the original three, and enlists the cooperation of all legally qualified medical practitioners who agree to practise under the rules of the Corporation. The fees charged subscribers are as follows:

Subscriber	$2.00 per month
1st Dependent	1.75 per month
2nd Dependent	1.50 per month
3rd Dependent	1.25 per month

4th and each subsequent dependent, $1.00 per month.

The benefits rendered are,—

1. The services of participating physicians in home, office or hospital, including consultation.

2. Surgical procedures within the scope of a competent surgeon.

3. Semi-private available accommodation or a sum not to exceed $3.50 per day towards the cost of hospitalization in an approved hospital.

4. All necessary nursing.

5. Maternity service to subscribers who have paid dues for 10 consecutive months previous to confinement.

There is a two-months' probationary period and the subscriber must pay 3 months' subscription before becoming entitled to any service. Mental illness and chronic tuberculosis in institutions are not included in the conditions eligible for treatment.

As previously mentioned, the actual cost of medical care can only be disclosed by the operation of the scheme and the subscription rates will be adjusted accordingly when this information is available. The plan to be successful must adequately provide for the services rendered and, as no con-

tributions are forthcoming from others than participants, this adjustibility is important. Payment to Doctors is on a unit of service basis at minimum O.M.A. tariff rates. This, while requiring more organization and supervision than payment per capita, is believed to be conducive to a better type of service and will provide much needed statistics.

The progress made in Associated Medical Services in the fifteen months of its existence is very encouraging to those familiar with its operation. Many problems have been solved and many more await solution, but it has been again demonstrated that the provision of a complete medical service is possible by a cooperative effort between physicians and the public who are in need of what we have to offer.

In addition, the Ontario Medical Association maintains a central office with the facilities for informing the profession, by letter or Bulletin, regarding subjects of importance. Here is a clearing house for matters affecting the every-day welfare of Doctors, a bureau for the disposal of practices, the obtaining of assistants and locum tenens, and for advice to those about to enter practice. The volume of correspondence which passes through the office every day testifies to the useful place the Association fills in the lives of the Doctors of Ontario.

As the scope of this article is, by definition, provincial in character, very little has been said about the Canadian Medical Association which represents Organized Medicine in the national field. The function of that body has been to represent the Doctors of Canada in similar phases of activity to those described for the Provincial Association. This it has done and is doing in a fashion which transcends the efforts of any of its component parts. These parts, the Provincial Associations, have this year placed themselves in a more intimate relationship with the parent body by applying for recognition as Divisions of the Canadian Medical Association. The Ontario Medical Association is now known alternately as The Canadian Medical Association, Ontario Division. We now work together as a Canadian unit and whatever problem arises, we now face it, not as the Doctors of Ontario, but as the Doctors of Canada. We have set an example to the rest of Canada by uniting instead of striving to divide ourselves.

When one surveys a record of achievement such as is presented by the increase in influence and usefulness of Organized Medicine in this Province and this Dominion over the past twenty years, one usually finds an individual whose efforts are largely responsible for the progress made. That man is not hard to identify in this case. He is Dr. T. C. Routley who has recently resigned after twenty years' service as Secretary of the Ontario Medical Association and who now devotes his full time to the exacting position of General Secretary of the Canadian Medical Association. Although he would be the last to admit it, there is no mere coincidence in the fact that the rise of Organized Medicine in Canada dates from the time he was identified with it in an executive capacity.

The need for a strongly-organized medical profession was never more evident than it is today. The development of the next few years will probably affect the practice of medicine more profoundly than anything which has yet transpired. The best thought and effort of the profession will be necessary to meet the problems as they present themselves. The voluntary and democratic Associations will be the channels through which the collective opinions of the Doctors will be made known. The undergraduates of today will be the practitioners of tomorrow, and it is hoped that the outline here presented will commend the support of organized medicine to you.

THE MODERN TREATMENT OF PNEUMONIA

By W. HURST BROWN, M.A., B.M. (Oxon.), M.R.C.P. (Lond.)

It has recently been stated (Horsfall) that the deaths due to lobar pneumonia in the United States alone have averaged 100,000 per year. By methods now in use it is estimated that 40,000 of these deaths are avoidable. Still newer methods, at present under preliminary trial, have already justified the expectation that a further substantial number may be added to the ranks of the recovered. It is the present purpose to explain how this result may be achieved.

Until the very recent past the treatment of pneumonia has been the application of the principles of good nursing plus the intelligent employment of symptomatic and supportive measures by the physician. Let no one suppose that these have been supplanted by the new therapy. The importance of comfort conducive to sleep: of an adequate (3000 cc. per 24 hours) fluid intake; of the use of counter irritants, binders, or of the morphine derivatives to allay the exhausting agony of pleuritic pain: and of stupes, enemata and pituitrin for abdominal distension—the absolute importance of these measures remains. The use of oxygen by chamber, tent or nasal catheters for cyanosis, dyspnoea and even delirium as well as the use of cardiac stimulants and digitalis to help the failing heart are still demanded when the indications are present. But it must be realised that all of these procedures accomplish only one thing —they give the patient the best care and support that can be given him in his fight with the pneumococcus. It is still up to him to win his battle by himself; for none of our aid, important as it may be, is directed to weakening his foe.

The dominating principle of modern treatment is a direct attack on the pneumococcus. The resources of the patient are conserved as before but the fight is carried to the enemy. If such strategy is to be effective the foe must be studied and its weaknesses discovered.

Pasteur in 1881 first described an "areola" or capsule which envelops the pneumococcus when it is actively growing in the animal host. It has since been demonstrated that the capsule and what it contains endows the pneumococcus with many of its most formidable characteristics. In the first place the encapsulated pneumococcus is highly virulent and resists phagocytosis, whereas the uncapsulated naked or "rough" form is relatively harmless and is easily attacked by the leucocytes. Secondly, if naked or "rough" forms of pneumococci are injected into an animal whatever immune reaction is excited is the same for all "rough" forms regardless of their origin. In this sense "rough" forms do not call out specific immune responses. On the other hand the injection of the encapsulated pneumococci initiates an antibody response of a kind which is specific for the particular encapsulated variety injected and for no other. These antibodies are *agglutinins*, which cause the cocci to clump, *precipitins* which cause the capsular material to precipitate and *opsonins* which render the cocci more susceptible to phagocytosis.

Lastly, a fourth attribute of the immune response to encapsulated pneumococci causes the material contained within the capsule to swell out from the somatic body and eventually deprives the latter of its capsule altogether. This highly specific reaction or "Quellung" phenomenon, as it is called, was first described by Neufeld. To-day it is made use of in the Neufeld method for "typing" the encapsulated pneumococci. It is superfluous to add that the "rough" forms cannot be typed.

The Capsular Substance.

It is evident that the presence of a capsule is of the greatest importance to the pneumococcus, for on the quality of this substance depends its resistence to phagocytosis, its virulence and its type specificity. Avery et al in 1917 isolated the capsular substance from broth cultures of pneumococci and proved that it was a polysaccharide which they called the "specific soluble substance." They also showed that it had the capacity of reacting specifically with type specific immune sera by which it was precipitated. These soluble polysaccharides could therefore be typed. Cooper and co-workers were able to classify the encapsulated pneumococci into 32 varieties by noting the specific reaction of the capsules to immune rabbit sera, and showed that the type specificity for all depended upon the capsular material. Griffiths in England denuded Type I pneumococci of their capsules by growing them in the presence of immune serum. The "rough" forms so produced were then grown in the presence of the polysaccharide from Type II pneumococci. The heretofore Type I cocci then invested themselves with not only Type II capsules and capsular material, but also all the specific antigenic properties of the Type II pneumococcus and lost all their Type I characteristics.

It is therefore apparent that the importance of capsulation really depends upon the capsular substance and that this is a soluble polysaccharide of varying constitution to which must be attributed all of the important properties previously noted as being characteristic of the encapsulated forms.

The Interaction of Specific Polysaccharides and Antibodies.

Large quantities of capsular polysaccharides may be injected into an animal without giving rise to fever or any other discernible symptom or sign. They are harmless in the non-immunised animal. It can, however, be demonstrated that in an immunised animal they quickly neutralise the specific agglutinin antibody. The importance of this fact is obvious. In a patient with pneumococcal pneumonia an excess of the soluble capsular polysaccharide is synthesised by the pneumococci and can be recovered from the blood, urine and lungs. Now in an untreated case, as was demonstrated as long ago as 1891 by Klemperer and Klemperer, an excess of a protective substance appeared in the blood of the patient at or about the time of crisis. It is known to-day that an excess of circulating antibodies usually appears about that time so that it is almost certain that this fact is related to crisis. That the whole truth is not yet known is, however, at once apparent when it is recalled that on occasions an excess of circulating antibody may appear before, or even not until a week after, the crisis. Furthermore such an excess has been found in the blood of patients dying with pneumonia. On the other hand protection against pneumococcal pneumonia is not secure unless there is an excess of the specific antibody present. Whatever may be the nature of the hitherto undiscovered "other factor" in recovery it is clear that the effect of excess polysaccharide is to immobilise (by neutralisation) the antibodies as they are formed and thus exert an important antiphagocytic influence. By the same token it is apparent that if an attempt is made to attack the pneumococcus with the introduction of antibodies by the vehicle of specific immune sera no good result can be expected until an excess of antibodies is present in the region where the battle is raging. The presence of excessive polysaccharides in the blood will neutralise the antibodies before they can attack the pneumococcus in the lungs. Because the actively growing pneumococci rapidly produce excessive polysaccharide in large quantities it is obvious that delay in instituting serum thereapy or long intervals between doses are both undesirable and expensive. These common faults

leave the dangerous issue unduly long in doubt and increase the total amount of serum which must eventually be used.

Recently another item of knowledge of the interaction of specific antibodies and the capsular polysaccharide has been utilised. In 1933 Francis showed that if 0.01 mgm. of the specific capsular polysaccharide was injected intradermally in a patient suffering from pneumococcal pneumonia of the same type, no reaction occurred at the site of injection unless an excess of circulating specific antibody was present. Immediately there was such an excess a local reaction appeared.

Serum Therapy.

From what has been said, the introduction into the body of type specific immune sera bearing high titres of antibodies should prove to be an effectual attack on the pneumococcus. This has been attempted for the last fifty years but it has taken on a new significance since the type specific properties of the pneumococcus have been recognized. Two kinds of sera (horse and rabbit) have been used. The effectiveness of the former has now been established, the latter is still under trial. Of some thirty-five differences between the two sera, four considerations, theoretically at least, weigh in favor of rabbit serum.

1. It is easier to obtain a higher titre of antibodies.

2. The size of the antibodies in rabbit serum is about ¼ that in horse serum and it ought, therefore, to have a greater penetrating power.

3. It is possible to immunise rabbits more rapidly than horses.

4. It is cheaper to prepare rabbit serum in small lots for the unusual or rare types of pneumococcal infections.

About 76% of all lobar pneumonia can at present be treated by sera. These are types 1, 2, 3, 4, 5, 6, 7, 8 and 14. Types 1 and 2 constitute from 40% to 60% of all cases and these respond very well to serum treatment. Type 3 is not responsive to serum treatment, perhaps because of the very large amount of polysaccharide which is liberated.

When a case of pneumococcal pneumonia has been typed and found to be suitable for serum therapy, it is important to ascertain whether the patient has ever had previous serum treatments and also whether he has suffered from asthma, hay fever or urticaria. In any event, the next step is to test the patient for sensitivity to the serum to be used. This is done in three ways.

(a) Conjunctival Test. One drop of a 1 in 10 dilution in saline of the serum is instilled into the conjunctual sac. The result is read after 15 minutes. Severe reactions should be combatted with a drop of 1 in 1000 adrenalin.

(b) Intradermal test. Inject 0.1 cc. of 1 in 10 dilution in saline of serum intracutaneously and read after 15 minutes.

(c) Intravenous Test (unnecessary with horse serum). If a and b are negative, inject 5 cc. of 1 in 100 dilution of the serum intravenously, after recording the pulse rate and blood pressure. If after 5 minutes the pulse has risen 20 points or the blood pressure has fallen 20 points, the patient must be considered sensitive to the serum.

If any of the three tests are positive, desensitisation of the patient may be attempted. A strong conjunctival reaction usually indicates that this will be unsuccessful, no matter how carefully it is carried out.

THE ADMINISTRATION OF SERUM.

There are three ways in which serum is given by the intravenous route. The first has, until recently, been in general use. By this method a beginning is made with small doses of 5,000 to 10,000 units and rapidly increased to 20,000 to 50,000 units, every four to six hours. For reasons already noted, this method is too slow for critically ill patients.

The second method swings to the

opposite extreme and an initial dose of up to 300,000 units is given. This seems to be unduly dangerous and has the disadvantage that much more serum may be given than is really necessary to produce a cure—and serum is expensive.

The third or "titration" method is more scientific than either of the others and has the advantage of avoiding waste. By this method after a preliminary testing period of small doses, 40,000 to 60,000 units of serum are given every hour. Fifteen or twenty minutes before the successive doses are given, an intracutaneous injection of the specific polysaccharide (pneumococcal antigen) is made side by side with a saline control.

If a bleb, perhaps with pseudopods appears, surrounded by a red areola, the reaction is positive and serum therapy should be then discontinued, regardless of the height of fever or the clinical condition of the patient. If the reaction is negative or after positives have been obtained, the reaction again becomes negative, further serum is called for. In the words of Francis, "When positive it invariably denotes that recovery has begun; when negative it indicates further serum therapy."

It has been held that it is useless to give serum after the third day from the onset. This is not now so generally believed. It is true that much larger doses may be required but if enough is given a good result is to be expected. The interaction between the specific polysaccharide and the antibodies of the serum provides a ready explanation of why in these cases very large doses of serum may be required. On some occasions, however, the patient has elaborated a considerable amount of his own antibodies and in these instances, surprisingly small amounts of serum may be required to establish an excess of the circulating antibodies. In either case the Francis skin test is of the greatest value in indicating when a sufficient amount of serum has been given.

Finland has drawn attention to the importance of the extent of the pneumococcic process in the lung and the type of the pneumococcus in estimating the probable dose which will be required. It is true that type 2 usually requires about double the amount necessary for a type 1 infection, this is probably explainable on the character and amount of the polysaccharide liberated by the organisms of type 2. It is also evident that except when a positive blood culture is obtained, there can be no reliable method of estimating the amount of serum which will be required since the efficiency of the individual immunity response is unknown.

Attention should be drawn to certain reactions which may occur during serum therapy. The first, and really dangerous reaction is that of anaphylactic shock, because this, though very rare, is always a fatal possibility. A syringe containing 1 cc. of 1 in 1,000 of adrenalin should always be close at hand during the administration of serum. Adrenalin should also be given and serum treatment immediately discontinued when respiratory stridor, asthma, pain in the back with urinary suppression or haemoglobinuria appear.

The second reaction,* which is more common when certain highly concentrated rabbit sera are used, is a thermal reaction. This usually occurs from ½ hour to 1½ hours after therapy is commenced. It begins with a severe chill lasting five to 10 minutes and then the temperature rises sharply to as high as 107° or more. Alarming and even dangerous to life, these reactions do not absolutely contraindicate further serum treatment, but this should be recommended with great care. 10 cc. of a 10% solution of calcium chloride intravenously at the onset of the chill usually has a magical effect in immediately arresting the reaction. It is important to remember that calcium chloride should never be given intra-

*Uncommon when processed serum issued.

venously, if digitalis has previously been administered.

Lastly, a delayed serum reaction, or serum sickness with urticaria, arthritis, headache, fever, a rapid pulse, etc., may occur from 5 to 12 days after serum therapy has been initiated.

THE RESULTS OF SERUM THERAPY.

The administration of sufficient of the specific anti-serum over a short period of time results, shortly after an excess of the circulating antibodies can be demonstrated by the Francis test, in a dramatic fall of temperature. This fall of temperature coincides with a remarkable easing of the patient's distressing symptoms and is comparable, both subjectively and objectively, to that observed in spontaneously occurring crises. If the antibodies continue to be in excess in the hours that follow, the temperature remains down, and, in the absence of complications, steady progress is made toward complete recovery. Repeated intradermal tests should be made to ascertain that the antibody excess is persistent, for it has repeatedly been shown that the excess of antibody may be transient and in this event the temperature may again rise with a coincident worsening of the clinical condition. In such instances a surprisingly large amount of serum may have to be given to bring the disease again under control. The intradermal test here has a diagnostic value since it may help to distinguish between the instances where the temperature rise is due to an exacerbation of the pneumonic process per se (lack of and excess circulating antibody) and those in which the rise in fever is due to the development of an empyema (circulating antibodies still in excess). It may be noticed in passing that when an early crisis is induced by serum therapy, that the signs of consolidation usually persist for several days and once consolidation has occurred, there does not seem to be any material shortening of the number of days which must be spent in hospital as compared with cases in which spontaneous crises occur.

RELATION OF CASE FATALITY RATE TO BACTERAEMIA.

Treatment	Negative Blood Cultures		Positive Blood Cultures	
	Cases treated	Death rate	Cases treated	Death rate
Untreated (Routine)	1,685	14%	408	71%
Horse Serum	1,138	9%	360	54%
Rabbit Serum	100	6.9%	64	23%

The results of serum therapy are best judged by its effect on the case fatality rate, particularly in cases with a pneumococcic septicaemia. In the accompanying chart, taken from Bulowa's reports, the decisive reduction in the case fatality rate in cases with positive blood cultures is of signal importance. At the Toronto Western Hospital, during the past year, comparative figures for rabbit serum therapy are 10% deaths in all cases and 20% in those with positive blood cultures.

Evidence which is available from various centres warrants the conclusion that:

(a) In lung infections with Types 1 and 2 horse serum is of undeniable value in reducing the case fatality rate.

(b) Rabbit serum is still under trial but it seems to be fully as effective as horse serum in type 1 and rather more effective in types 2, 5, 7, 8 and 14.

(c) Serum treatment in type 3 pneumonia has, up to the present, yielded very disappointing results.

The conclusion is inescapable that (excluding type 3) at least 65% of

lobar pneumonias in most centres fall into types for which sera are available and useful, and that by rapidly instituted and intelligently controlled serum therapy the death rate should be more than cut in half.

Chemotherapy

Finally a word may be added with respect to the latest addition to our weapon against the pneumococcus. Since the introduction of the Sulphanilamide group of drugs a chemotherapeutic attack has been attempted. Although there have been some indications that sulphanilamide may be effective in type 3 pneumonias, it cannot be said that anything like decisive results have been published. During the past year, however, a new drug 2 — (para-aminobenzenesulphonamidopyridine) or "M & B. 693" has appeared (other names suggested for the drug include "Dagenan," "Sulphanylyl-pyridine" and "Sulphopyridine.")

This chemical substance is reputed to be as effective against the streptococcus (animal experiments) as is sulphanilamide, but it is chiefly interesting because of its greater efficiency in pneumococcic infections. It seems to act by virtue of a bacteriostatic effect on the pneumococci; inhibiting their multiplication and growth. It may be that it also prevents an elaboration of toxic substances; but this is as yet unproven. In the few reports which have appeared to date, the drug has seemed clinically to be effective. In one series of 100 cases the death rate was only 9% as compared with 27% in the control series.

In view of the paucity of reliable evidence at hand it is manifestly premature to draw conclusions. The drug is now under trial in a large number of centres. There are many difficulties being encountered, the chief one being the great variability with which it is absorbed into the blood stream. This has a rendered authoritative pronouncement regarding its clinical value and its true toxicity uncertain and indeterminate.

THE VITAMINS

II. VITAMIN B_1

By WALLACE GRAHAM, M.D., D.D.S., M.R.C.P.
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The work of McCollum and Davis in 1913 led to the discovery of a growth-stimulating substance now known as Vitamin A. Further work showed that the unpurified milk-sugar used in their diets contained a second essential growth-promoting factor which was later found to be widely distributed in food stuffs, particularly in wheat germ, rice polishings and yeast. This second factor was called by McCollum water-soluble B. This original simple concept of vitamin B has had to be replaced by one more intricate as accumulating evidence showed that vitamin B was a complex substance containing a heat-labile growth-promoting component necessary for the prevention of polyneuritis in rats and pigeons and a heat-stable growth-promoting component necessary for the prevention of dermatitis in rats.

In the United States the term vitamin B was retained for the thermolabile anti-neuritic component and vitamin G (in honour of Goldberger) was suggested for the thermostable anti-dermatitis or anti-pellagra factor. British workers, on the other hand, adopted the terms B_1 and B_2 for the two components.

It has since become evident that the

thermostable fraction first called G or B_2 is not a single chemical substance but an extremely complex material, the status of which at the present time is incomplete and confusing. However, the present conception of the B complex may be stated as follows:

B_1 (HEAT-LABILE)

Thiamin chloride (U.S.A.); Aneurin (Europe). The growth promoting vitamin, a deficiency of which results in polyneuritis in rats and pigeons.

B_2 COMPLEX (HEAT- STABLE)

Riboflavin—sometimes called B_2 or G. B_6 —rat antidermatitis factor—exact status not yet determined.
Filtrate-factor or check pellagra factor. At present not sufficient evidence that this is distinct from the
Pellagra-preventing factor which also prevents black tongue in dogs.

As yet the number of factors in the water-soluble B complex that are essential to the human organism is not fully determined. We shall deal first with vitamin B_1.

Physiology and Chemistry

For many years the physiological action of vitamin B_1 has been associated with carbohydrate metabolism and with the oxidative mechanisms in the body. Funk, in 1914, first observed that polyneuritis in pigeons was produced more rapidly with increasing amounts of carbohydrate in the diet, and twenty years later Evans and Zepkovsky[1] showed that a high carbohydrate diet is more effective in producing symptoms of B_1 deficiency than one high in fat. Collazo, in 1923, concluded that the B_1 deficiency resulted in deranged carbohydrate metabolism with the formation of toxic substances. The work of Peters[2] is widely accepted in part: that B_1 is a catalyst needed for the oxidative removal of one of the lower products of carbohydrate metabolism. He showed that pyruvic acid accumulates in the brains of pigeons deprived of B_1. Addition of the vitamin to the diet causes the pyruvic acid to disappear. Pyruvic acid is an intermediate product of carbohydrate metabolism and Peters suggested that in B_1 deficiency the metabolism is incomplete, pyruvic acid is formed and not utilized, the disturbance resulting in the nervous manifestations of the disease. Platt and Lu[3] showed that pyruvate accumulates not only in the brain but in the blood and cerebrospinal fluid of patients with B_1 deficiency. This work has led to the estimation of bisulphite-binding substances (chiefly pyruvic acid) in the blood and they are found to parallel the clinical manifestations of B_1 deficiency and so may serve as an index to its severity. There is some controversy in regard to the above explanation. McHenry[4] reports observations which suggest that the principal function of B_1 is to cause the formation of fat from carbohydrate and that at least a part of the disappearance of pyruvate when B_1 is administered is due to the formation of fat.

Jansen and Donath first isolated B_1 from natural sources in 1926 and suggested the name Aneurin which is widely used in Europe. Its isolation was difficult as it occurs in the proportion of only twenty to thirty parts per million in the richest food sources, and work was carried on in many laboratories for seventeen years before it was accomplished. In 1934, Williams and his co-workers were able to devise a method for securing consistent yields of B_1 of approximately five grams from a ton of rice polishings. This yield provided sufficient B_1 for study of its structure, and its synthesis quickly followed. Williams suggested the name Thiamin Chloride which is used in America. The commercial product is now produced on an economical basis, the pure crystalline compound having the formula $C_{12}H_{16}ON_4S.HCl$.

Storage and Excretion

Most animals are unable to store a large reserve of vitamin B_1. Under normal conditions the heart, liver and kidneys contain most of the vitamin. Westenbrinck, in 1932, showed that all organs, with the exception of the brain, in rats lose their B_1 content in five weeks on a B_1 free diet. In humans 5

to 8 per cent of the B_1 ingested is quickly eliminated unchanged by the kidneys, and the greater part of the remainder is presumably destroyed by metabolic changes in the tissues[5]. The amount in the urine is said to vary with the diet but as yet no practical method is available to judge a patient's intake of vitamin B_1 by urinary tests. The amount lost in the faeces is small.

Assay and Standards

The existing methods of assay of vitamin B_1 are biologic in nature and are not entirely satisfactory. They chiefly involve the use of pigeons and rats. In pigeons, the factors of protection against polyneuritis, weight maintenance and the cure of polyneuritis after symptoms have developed are used. Rat tests are based mainly on growth and the cure of polyneuritis. A third method in rats is the electrocardiographic "bradycardia" method. Drury, Harris and Maudsley in 1930 showed that rats on a B_1 deficient diet have a slow heart rate which returns to normal on the administration of vitamin B_1. The deficient rats had a heart rate of approximately 300 per minute, the normal rate being 500 to 530. This has led to a test for B_1 in foodstuffs, the increase in heart rate being roughly proportional to the amount of B_1 in the food. The rat growth method, however, is the one most widely used for assay of foods. Efforts are now being made to devise a chemical test for B_1 as the above methods are obviously not practical for clinical use.

The amount of B_1 present in any foodstuff is stated in terms of International Units and the chosen standard is at present an adsorption product of B_1. The vitamin B_1 from 100 kg. of rice polishings is adsorbed on 3 kg. of fullers' earth and the International Unit is the B_1 activity of 10 mgm. of the above standardized adsorption product. For example: 10 to 20 mgm. of this preparation are required to maintain normal growth in a young rat on a diet deficient in B_1 but complete in all other respects.

Clinical Manifestations and Pathology

It is naturally unusual to find a condition of pure B_1 deficiency without lack of other vitamins as well. In fact such cases are rarely, if ever, seen in Toronto. However, the oriental disease beriberi probably represents an almost pure B_1 deficiency. Beriberi is found chiefly in Eastern Asiatic countries (Japan, China, Dutch East Indies, etc.) but is also found in the U.S.A. in the rice-growing districts of Louisiana, and occasional outbreaks have been reported in public institutions.

The dietary origin of the condition was first demonstrated by Takaki in 1886 in the Japanese naval forces when he showed that the addition of meat and vegetables to the sailors' diet and the replacement of rice, in part, by wheat and barley greatly reduced the incidence of the disease. Four years later Eijkman established the deficient factor when he produced polyneuritis in pigeons on a diet of polished rice.

The clinical symptoms are limited almost entirely to the cardiovascular, gastrointestinal and nervous systems. After an initial period of lack of energy, weakness, vague pains and loss of appetite, the symptoms of neuritis are generally the first to appear The neuritis is usually a multiple, peripheral type, most frequent in the lower extremities and associated with numbness, burning pains and acute tenderness on squeezing the calf muscles. The loss of ankle and knee jerks is common. Localized areas of anaesthesia develop of the glove and stocking type. Later, foot or wrist drop may appear.

The cardiovascular symptoms develop later with tachycardia, early dependent oedema and cardiac enlargement. In severe forms general anasarca is seen. Death in acute beriberi is due to heart failure.

Loss of appetite is an early gastrointestinal symptom and may be associated with a smooth, rather beefy tongue, intestinal atony and constipation.

In infants the onset is more rapid and practically all the cases are of the

"wet" type due to a marked effect on the cardiovascular system.

The nervous manifestations have been shown to be due to degeneration of the myelin sheaths which occur in scattered places in all tracts of the cord but particularly in the posterior columns. Degeneration is also seen in the anterior and posterior nerve roots and in some cases the axis cylinder is fragmented as well[6]. In chronic cases the heart shows hypertrophy and dilatation, the most striking and constant changes being found in the right heart. The cause of this is unknown and the exact mechanism of the heart failure is not clear.

The atony of the colon resulting from malnutrition, produced in the classical studies of McCarrison, was corrected by a high vitamin and low carbohydrate diet. The studies of Hargreaves, Fletcher and Dickson[7] and of Babkin[3] indicate that B_1 may be a factor of importance in controlling the secretory and motor functions of the gastrointestinal tract. A marked diminution in gastric secretion occurs in B_1 deficiency, which is restored on feeding yeast, a fact which suggests a possible explanation for the anorexia almost constantly seen in B_1 avitaminosis.

Other forms of neuritis: (1) *Alcoholic*:—Polyneuritis in the alcohol addict was formerly attributed to the direct toxic action of alcohol. It has now been shown[9] that the polyneuritis of beriberi and alcohol are identical. Much of the caloric need of the alcoholic is satisfied by vitamin free alcohol with a consequent inadequate consumption of many of the essential elements of nutrition. When given vitamin B_1 the neuritis improves even when they continue to drink a pint to a quart of whisky daily[10].

(2) *Pregnancy neuritis*:—Some cases of pregnancy neuritis, seen chiefly in occidental countries, are due to B_1 deficiency. In such cases complete relief of symptoms is reported by Vorhaus, Williams and Waterman[11] on oral doses of crystalline B_1, 10 mg. daily.

The use of vitamin B_1 in cases of nervous disease not definitely associated with vitamin deficiency, such as infectious polyneuritis, subacute combined degeneration of the cord, postdiphtheritic paralysis, anterior poliomyelitis, etc., is not indicated unless a dietary deficiency is present.

Sources of B_1

Although vitamin B_1 is present in a large variety of foods, both of plant and animal origin, there are no really potent sources with the exception of whole seeds and yeast. In planning adequate diets, therefore, several items must be depended on to furnish the day's supply of B_1 as the vitamin is not stored in the body to any great extent.

The chief sources are cereal grains, legumes, egg yolk, pork and, to a lesser extent, milk, potatoes, tomatoes and various acid fruits. One pint of milk will supply 36 per cent of the daily requirement of an average man. Potatoes are an outstanding source because of the large amount consumed in America. The jacket is not a richer source than the interior but is important only because it prevents the main loss of the soluble vitamin into the cooking water which is discarded. As there is little storage of B_1 in animals, it is not surprising that meats are comparatively deficient, with the exception of pork which contains about seven times the quantity found in beef. The refining of foods removes the most potent sources of B_1 and conditions comparable to baking may cause a loss as high as 50 per cent. Actual canning causes little loss, the preservation of the vitamin depending upon the method of preparation of the food before it is canned.[12]

Human Requirements[13]

Unfortunately at the present time the standard of vitamin B_1 is in terms of International Units rather than in milligrams of thiamin chloride which would be more ideal. Cowgill has shown that the requirement of B_1 is dependent on the body weight, caloric consumption and metabolism of the individual, with special reference to the calories

from carbohydrates because, as mentioned previously, the deficiency occurs more readily on a high carbohydrate diet. An adult weighing 154 pounds requires approximately 280 Units per day, or 10 Units per 100 calories. Remembering that B_1 has a definite effect on growth in children, as shown by Summerfeldt and Ross[14], a child should have 20 to 25 Units per 100 calories. For several months the chief item in the diet of an infant is milk alone and the B_1 content of maternal milk is primarily dependent upon the amount of vitamin ingested by the mother. The mother, therefore, requires 15 to 20 Units per 100 calories and the baby should have a minimum of 80 Units daily.

Other factors also influence the B_1 requirement. The need is directly related to caloric exchange so that in conditions of heightened metabolism from exercise, prolonged fevers, hyperthyroidism, etc., 15 to 20 Units per 100 calories is suggested. It has been shown that vigorous diuresis promotes loss of B_1 through the kidneys so that Cowgill suggests at least 20 Units per 100 calories in cases with pronounced diuresis. Similarly in diarrhoea Cowgill and Dann have shown a 50 to 70 per cent loss of the vitamin in dogs, and 20 Units per 100 calories is suggested in such cases, or parenteral administration of the vitamin.

B_1 Therapy in Disease

Vitamin B_1 is readily absorbed whether given by mouth or parenterally. In beriberi B_1 may be employed in crystalline form or substances rich in B_1 content may be used. Doses of approximately 20 mgm. daily, intramuscularly or intravenously, for two weeks are recommended, to be followed by decreasing doses orally, as improvement occurs. Brewers' yeast, plain or autolysed, may be used in doses of 30 gm. three times a day. A well balanced diet should be given as well. Acute beriberi may respond in a few days but chronic cases may require months.

In regard to nervous manifestations, it must be remembered that a response to adequate therapy will occur only in cases of short duration. Little or no response is to be expected in cases where permanent destruction of nerve tissue has taken place.

In cases of alcoholic neuritis, Goodhart and Jolliffe[9] have shown that four times the normal daily requirement of B_1 was needed to obtain a return of the ankle jerks within twenty-one days. It would seem that there is no danger from overdosage. Vorhaus, Williams and Waterman have reported the oral administration of single doses up to 90 mgm. with no harmful effect.

As in the case of vitamin A, one rarely, if ever, sees a case of pure vitamin B_1 deficiency in our hospitals in Toronto. Should the question of B_1 deficiency arise it should be rectified, if necessary, by the immediate administration of concentrated vitamin B_1 to be followed by a diet adequate in B_1. As Williams very aptly stated, the physician should recommend the grocery store rather than the drug store for a normal intake of the vitamins.

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SOME PRINCIPLES OF VALUE IN THE DIAGNOSIS OF ABDOMINAL DISEASE

By HUBERT HAYWARD, B.A., M.D.

This article is written expressly for students who are in their early days of clinical surgery. Here in the maze of clinical material and working with men in whom experience and the acquisition of the art of the practice of medicine have seemingly forced the basic sciences into a less important place, the student is apt to forget that appeal to the basic sciences for an explanation of signs and symptoms is the one and only accurate method of arriving at an intelligent understanding of clinical problems. — I speak of the value of anatomy, physiology and pathology in clinical medicine and surgery. In every difficult case in diagnosis an accurate interpretation and evaluation of the clinical manifestations of disturbed anatomy and physiology is necessary. Such is possible only by men well versed in these basic subjects.

I wish now to draw your attention particularly to some of the difficulties of diagnosis encountered in abdominal disease, especially when acute in form. Students are amazed and disturbed at the lack of typical pictures of seemingly well-defined clinical entities such as acute appendicitis and perforated duodenal ulcer. Because of the rapidity with which complications follow these conditions and because of the multitude of organs involved and the many intricacies of their function, typical pictures are well nigh impossible. Moreover the organs involved are hidden from touch and sight by an abdominal wall often too well fortified by a thick layer of fat. Hence we must depend upon the peculiar manner in which these organs exteriorize their disease. The localization of intra-abdominal disease is accurate only when the abdominal wall is involved. Unfortunately there are many organs surrounded by relatively little abdominal wall upon which the pictures of all the varieties of conditions to which each is susceptible may at one time or another be portrayed.

The following steps must be pursued in order to arrive at a diagnosis, (1) localize the organ. (2) determine the nature of the disease from which that organ suffers.

In the difficult task of localizing the responsible organ it is useful to consider viscera as of two types, (a) Those mid-line in origin (including stomach, small bowel, appendix, colon, gall-bladder, bile ducts, pancreas, pancreatic ducts and liver) in which pain arising within them is referred to the mid-line. (b) Those not mid-line in origin (including kidneys, ureters, Fallopian tubes and ovaries) which refer their pain to one or other side of the mid-line. All these organs are supplied by the vagus and sympathetic nervous mechanisms in which the power of accurate localization is notoriously poor as compared with that in the pathways of somatic nerves. It is also easy to understand how disease of one organ may readily affect the function of another with the production of reflex symptoms. It is well to remember that most of these organs are, or contain, muscular tube structures which readily respond by pain of a crampy nature to over-contraction or distension. Hence we find in the early stages of many acute abdominal diseases, a sameness of response by a multitude of organs. In the later stages of disease, tissues with better powers of making their exact presence known, notably the parietal peritoneum, become involved. These are supplied by somatic nerves, one of the most important functions of which, happily, is localization.

In determining the site of the diseased organ and the nature of its ailment, the clinician has 3 valuable diag-

nostic methods at his disposal. (1) History taking (2) Physical examination (3) Laboratory examinations. The history of an abdominal complaint is more important than the other two together although all three are necessary for accuracy in diagnosis.

History

In history taking pay particular attention to the following symptoms.

(1) *Pain.*—Pain is the most frequent and distressing symptom of abdominal disease. In character it is essentially of one of two types. (a) of variable intensity (crampy or colicy) (b) of uniform intensity (aching, gnawing, boring). The former is caused by obstruction in a tubular organ or duct and is due to compression or stretching of nerve endings in its walls. If the organ is mid-line in origin this pain is complained of in the mid-zone of the abdomen, and the more proximal in origin the organ is, the higher up on the abdominal wall will the pain be referred, generally speaking. If the organ is not mid-line in origin pain is referred more to one or other side as in tubal pregnancy and ureteral colic, and in the latter, radiation to the genitals and inner side of the thigh probably depends upon the fact that the distal portion of a ureter receives somatic nerve fibres from L. 1 and 2 segments.

Pain of uniform intensity, when not severe, is found in more chronic abdominal lesions. Non-muscular tissues such as the liver, kidneys, pancreas, peritoneum and lymph glands, produce such pain. Involvement of the coeliac plexus by inflammation or tumour may produce a severe, boring type of pain which may be referred to the back.

(2) *Flatulence, anorexia, nausea, vomiting.*—These usually are reflex in origin. The stomach has been spoken of as the sentinel of the abdomen and it is well to remember that these symptoms of disturbed gastric function do not necessarily mean disease of the stomach. Any organ (and this includes pancreas, gall-bladder, tubes, ovary, testicle, ureter and heart) supplied by the vagus and the sympathetic can produce reflex gastric symptoms.

Likewise diarrhoea and constipation, while often caused by direct irritation or obstruction to the gut may be due to disturbances in the reflex arcs, most famous of which is the gastro-colic.

Speaking generally, the rapidity of onset, severity and intensity of pain and reflex symptoms are roughly an index of the severity of the condition and consequent threat to life.

Past history of the function of organs such as dyspepsias, urinary frequency or haematuria, and menstrual dysfunction aid in localizing disease. This is most valuable in determining preoperatively the source of a peritonitis and much time and confusion may be saved at operation in localizing the causative organ. I might mention the odd case of perforated peptic ulcer which may manifest itself by pain in the right lower quadrant due to tracking of intestinal contents down the right lateral gutter of the peritoneum. Almost invariably these are considered preoperatively as cases of appendicitis and it is well that the true nature of the case be recognized before the abdomen is closed.

Physical Examination

Note the posture of the patient,—whether writhing around as occurs with colicy pain or lying still. One leg may be significantly flexed.

Tenderness, when present, is a most valuable clinical sign. When disease is confined to a viscus, the latter is tender on pressure if such be sufficient to distort it. When disease extends beyond the organ involving the parietal peritoneum, tenderness is more localized. This can be elicited either by pressing the parietal peritoneum against an inflamed organ, or by letting the organ impinge upon the peritoneum as occurs on rolling the patient over, since most abdominal organs have a considerable degree of mobility. Hence, while in the early stages the patient may writhe around, later he may lie alarmingly still.

Rigidity of the abdominal musculature is also a valuable sign when present. With colicy pain, the abdominal wall becomes voluntarily rigid as part of or as the only manifestation of the writhing posture. As parietal peritoneum becomes involved, because it is of somatic innervation, rigidity becomes more localized over the inflamed area. Hyperaesthesia is a reflex phenomenon of variable value, similar in origin to reflex rigidity.

Acute abdominal diseases produce considerable *constitutional effects*. Pulse rate, blood pressure levels, respiratory rate, temperature and the degree of shock all demand careful consideration. Elevation of pulse rate is by and large, a finer index of a toxic constitutional upset than is temperature elevation. Early localized inflammatory lesions, where toxic absorption is slow may give little or no elevation of temperature. This is due either to the inflammation being of low virulence or to obstruction of channels for absorption of toxic products (as in gangrenous appendicitis of rapid onset). Elevation of the pulse rate may thus be very significant. Fever implies inflammation of considerable extent or virulence.

Laboratory Examinations

Shock accompanies abdominal catastrophies with astounding regularity. Such shock is of one or a combination of two types. Type (a) is caused by pain from intense irritation of the peritoneum (as follows perforation of a peptic ulcer). Type (b) is due to massive intra-abdominal haemorrhage, i.e. blood loss. In differentiating between the two types haemoglobin determinations are almost specific. In shock due to intense peritoneal irritation, there is haemo-concentration; that is, high haemoglobin readings are obtained, the height depending upon the patient's normal level and upon the degree of shock. This is caused by a loss of fluid but not cells from the capillary bed into the interstitial tissues. In shock caused by massive haemorrhage into the peritoneal cavity, irritation by blood is not a major factor in its production. Here low haemoglobin readings are found very shortly after the haemorrhage, due to restoration of blood volume by fluid from tissue spaces. Compensatory vaso-constriction temporarily retains a normal haemoglobin reading, but fluid enters the blood stream rapidly—so rapidly in fact that a dog can be bled three times its normal blood volume within one-half hour, the extra fluid being supplied from tissue fluids, so that at the end the blood becomes nothing more than blood-tinged tissue fluid.

The white blood count is of much value but seldom of diagnostic significance in itself. Generally speaking. the more intense the peritoneal irritation or inflammatory process, the higher will be the white count. There are factors which make this generalization fallacious. White cell levels in the blood are considered consequent upon the absorption of toxic products and as mentioned before, channels of absorption from intensely inflamed areas may be obstructed as in the case of a gangrenous appendix, the rapid result of obstruction of blood supply and blood and lymphatic return. The flow of leucocytes into the inflamed part is considered due to local chemotaxis and the flow of leucocytes from bone marrow to blood-stream is considered due to the action of toxins on bone marrow, which at first may be stimulative, later depressive. However, as a localized inflammatory lesion becomes more extensive or suppurative huge numbers of leucocytes leave the blood-stream and pass into the inflamed area. Readings of 100,000 leucocytes per cubic millimetre of peritoneal exudate may be found, and the exudate may be very copious. Hence there is a tendency to depletion of the blood content of leucocytes, more of which, however, are immature forms than is found normally or in simple toxic depression of white-marrow function.

The value of other laboratory procedures is more obvious and we will

NEW YORK HOSPITAL — CORNELL MEDICAL COLLEGE
From the East showing Hospital

not labour the reader with details of urine and stool analyses. Suffice it to say in conclusion that it is hoped that the points brought forward, while commonplace, may take on a more significant meaning and build more faith in the applicability of the preclinical sciences to clinical practice.

SOME FAMOUS MEDICAL SCHOOLS

CORNELL UNIVERSITY MEDICAL COLLEGE

By LeROY O. TRAVIS, A.B., Cornell, '39.

The New York Hospital-Cornell Medical College Association was formed by mutual agreement in June, 1927, for the purpose of bringing together in one unit their facilities and of cooperating in the care of patients, medical education and medical research. In September, 1932, this plan became a reality as the twenty-four story first skyscraper hospital, erected along the East River between 68th and 70th streets adjoining the Rockfeller Institute of Medical Research, opened its doors to patients and students.

Absorbed into the group were the New York Hospital, the New York Lying-In, the Manhattan Maternity and Dispensary, Nursery and Child's Hospitals and the Cornell University Medical College. The Payne Whitney Psychiatric Clinic was established, to be associated with the New York Hospital—Westchester Division (formerly Bloomingdale Asylum.) The James Brady Urological Foundation was also included in the group.

Recently two impoortant additions have been made to this rising medical centre. They are the Kips Bay-Yorkville Health Centre (one of the thirty units of the decentralization project of the New York City Department of Health) which is managed jointly by the Health Department and the college; and the new Memorial Hospital for the treatment of cancer and allied diseases to be opened in the spring of 1939. Memorial Hospital first became associated with the college when Dr. James Ewing, then Professor of Pathology, was made president of the medical board of the hospital in 1913.

The past, present and future of Cornell Medical College are bound up with the life of the New York Hospital. When the college was established in 1898, its students were taught on the wards of that hospital. The medical wards of the hospital have been used to teach students of Kings College, later the College of Physicians and Surgeons, and of New York University Medical College before Cornell was founded. In 1771 King George III of England granted a charter to "The Society of the Hospital of the City of New York in America." Before that time there was only one hospital in the colonies, the Pennsylvania Hospital in Philadelphia.

In 1792 New York Hospital became the first in the state to care for mental diseases. In 1821 Bloomingdale Asylum was opened. Samuel Bard, one of the founders and first attending physicians of New York Hospital, was the founder of medical education in New York. The hospital's pharmacopoeia was the standard of the country until the United States Pharmacopoeia was first published in 1821. In 1873 the hospital helped establish the Bellevue Hospital Training School for Nurses, and four years later founded its own school, the second in the United States.

Cornell University Medical College was begun in 1898 after a split in the faculty of New York University Me-

dical College. The new school was endowed by Col. Oliver Hazard Payne, uncle of Mr. Payne Whitney, whose bequest was largely responsible for the present institution. When its first sessions began in 1898, there were 215 students enrolled, and the first graduating class in 1899 numbered 58, of whom 10 were women.

On the original teaching staff Lewis A. Conner, now Professor of Clinical Medicine, was an instructor in medicine, and Edward L. Keyes, now Professor Emeritus of Urology, was an assistant in anatomy. One year later James Ewing. Professor of Oncology, was appointed Profesor of Pathology, and a few years later Graham Lusk was elected to the chair of physiology, which he held until his retirement in 1932.

Until this year students were allowed to take their first year at Ithaca, New York. Now all students receive an equal foundation in New York City. The average enrolment in each class is between 70 and 75, making a total of 289 students for this year.

As medical education strode forward, it became manifest that the colleges required close connections with general and special hospitals. Cornell has long enjoyed such valuable relationships with the New York Hospital. Bellevue Hospital (the second medical and surgical divisions are staffed by Cornell), Memorial Hospital, the Berwind Free Maternity Clinic in Harlem, Willard Parker Hospital for contagious diseases, St. Luke's Hospital, and the New York State Hospital for Incipient Tuberculosis at Ray Brook.

When the college moved into its present quarters, a policy of a full time faculty was instituted. The reorganization was effected by Dr. G. Canby Robinson, who had organized the Vanderbilt University School of Medicine. Many old traditions and associates on the faculty were lost, but new ones have largely filled their places.

C. R. Stockard is profesor of anatomy and president of the Rockefeller Institute of Medical Research. He is well known for his work with Dr. George Papanicolaou on the vaginal smear, not to mention his ability to compose difficult but practical National Board questions in anatomy. E. E. DuBois, Profesor of Medicine is carrying on with W. H. Chambers, Assistant Professor of Physiology, the work on metabolism begun by Graham Lusk under the sponsorship of the Russell Sage Institute of Pathology.

Russell L. Cecil, Professor of Clinical Medicine, is widely known as editor of his "Textbook of Medicine," and for his work on pneumonia serum and on arthritis. Likewise is H. J. Stander, Professor of Obstetrics and Gynecology, recognized for his editorship of the seventh edition of "Williams' Obstetrics," as well as work on chemical changes in the blood in pregnancy and the toxemias of pregnancy. Harold E. Pardee, Assistant Professor of Clinical Medicine, is the chairman of the Heart Committee of the New York Tuberculosis and Health Association, which publishes "The Criteria for Classification of Heart Disease."

Eugene Opie, Professor of Pathology, has made contributions in many fields of pathology. His long years of study of tuberculosis seem to be bearing fruit in the recently reported heat-killed vaccine being developed with Jules Freund, Assistant Professor of Pathology. Of the recent additions to the faculty, Wilson G. Smillie, Professor of Public Health and Preventive Medicine, stands out for his work on hookworm disease in the South and Public Health administration at Harvard University.

Representatives of Cornell are found on faculties of medical colleges everywhere. Sixteen Cornell graduates hold positions of assistant professor or higher at the College of Physicians and Surgeons, our friendly rivals on the west side of Manhattan. At the University of Toronto you have R. E. Gaby, '07. J. K. Quigley, '03, is chief of the obstetrical department of the Rochester General Hospital and president of the Board of Medical Exam-

iners of New York State. D. A. Mackenzie, '04, is Clinical Professor of Urology at McGill University. P. B. Armstrong, '26, is Profesor of Anatomy at Syracuse Medical School.

The future of the hospital and the medical college depends on teaching and research keeping abreast of the times. Thus, following the trend toward specialization, straight internships are offered to qualifying graduates of Grade A Medical Schools, as well as long term assistant residencies and residencies.

The medical house staff consists of a resident, a first assistant resident, seven assistant residents and six interns appointed for one year terms. Interns are assigned to the medical pavilions. Assistant residents are given a rotating service on the medical pavilions of 109 beds, the Out-Patient department and the laboratories. The department of medicine includes neurology, dermatology and syphilology. Assistant residents are expected to engage in research.

Diagnosis by autopsy has been made in 69.4 per cent. of medical patients dying in the hospital. Ninety per cent. of the O.P.D. diagnoses are confirmed in the hospital.

The surgical service offers internships to six or more men each year, who work for one year on the surgical pavilions and the O.P.D. An internship for an experienced man is offered in Ear, Eye, Nose and Throat. The organization of the surgical department includes two residents and a varying number of assistant residents, pursuing graduate work lasting up to six years after the intern year and culminating in the post of resident surgeon. Work includes a period of training in surgical pathology, the surgical research laboratories, in general surgery, fractures, orthopedic surgery and urology. There are 246 beds available on the surgical pavilions.

By the end of six years the average surgeon in training has helped to care for 5,100 bed patients and 6,280 out patients, who have made 22,780 visits. He has attended about 1,000 surgical consultations and assisted at about 4,000 operations and performed 2,000 operations under the eyes of more experienced surgeons.

The obstetrical and gynecological house staff consists of one resident, ten assistant residents and ten interns, appointed for one year starting July first. The first year's training is entirely clinical with time spent on home and hospital deliveries and in the O.P.D. After three years of assistant resident's training with increasing responsibility and the performance of some major obstetrical and gynecological operative work, the service culminates in the fifth year with the residentship. Throughout there is competition with climination until one of the ten assistant residents becomes resident. The service has 190 beds, including 26 private and 20 semi-private rooms.

The combined service cares for about 5,500 patients annually, approximately 4,000 of these being obstetrical. The home delivery service, caring for about 800 of the patients, is conducted from the John E. Berwind Free Maternity Clinic.

The uncorrected maternal mortality, including ectopic pregnancies and abortions, for 1937 was 1.9 per 1,000 obstetrical discharges, or 2.1 per 1,000 pregnancies. The gross infant mortality rate, including all premature babies over 1,500 grams in weight, full term, deadborn and stillborn as well as neonatal deaths during puerperium to time of discharge from the hospital, was 3.14 per cent. The mortality rate on the gynecological service was 0.51 per cent.

The pediatric house staff consists of one resident, five assistant residents and five interns appointed for one year, who serve on the pavilions, premature and full-term nurseries, and in the pediatric O.P.D. They also work in special clinics devoted to allergy, endocrinology and metabolism, tuberculosis, cardiac disease, syphilis and to well-babies. There are 73 pediatrics beds in use at the present time.

Services are also offered in pathol-

ogy, psychiatry, and radiology with interns, assistant residents and residents appointed each year. In general, only those with previous training are accepted for appointments to the specialties.

All applications must be made before December first. The full and final list of recommendations for appointments are submitted to the Board of Governors of New York Hospital in January.

Certain professors in the preclinical departments offer graduate instruction as an integral part of the Graduate School of Cornell University, so that properly qualified students may become candidates for advanced degrees. Although Cornell intends to develop special opportunities for advanced work of high quality in the medical scientific and clinical fields, it does not at present offer work corresponding to that usually described as "clinical post-graduate work." Students may be admitted to the graduate school at the medical college as candidates for degrees or as "non-candidates."

Within the last year the hospital has published a book entitled "So Near the Gods" in which its principles and activities are outlined, as well as the needs for the future. It initiated a drive for funds to increase the endowment to provide maintainance funds for the general hospital, 24 fellowships, an increase in the number of beds on the medical pavilions, for opening all the pediatric floors and the children's convalescent home in White Plains, among other equally worthy projects.

Each year brings nearer the fulfillment of the idea and the ideal of a great medical centre where medicine does not bow down to economics, but economics is subservient to medicine.

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C.A.M.S.I. NOTES

By D. H. COPP, B.A., '39

Last March an important conference was held under the auspices of the University of Toronto Medical Society to discuss the need for a national organization of the medical students and internes of Canada. Student delegates were present from Toronto, McGill, Queen's and Western and internes from hospitals in Toronto, Kingston and Montreal. The response of the delegates was enthusiastic, and after discussing some of the problems confronting Canadian medical students, it was unanimously decided to form such an organization, to be called the Canadian Association of Medical Students and Internes, or simply abbreviated as CAMSI.

Membership in the CAMSI was to be open to all medical students and internes in Canada. The aims were held to be three fold:

(1) To further the welfare and interests of Canadian medical students and internes.

(2) To facilitate co-operation between students and faculties, and between internes and hospital staffs.

(3) To provide a medium for interchange of ideas between the medical schools of Canada.

More specific problems were considered as a basis for the future activities of the organization:

(1) *Student Health*—Incidence of illness among medical students should be investigated and possible schemes for health examination, health service, and health insurance studied.

(2) *Tuberculosis*—It was felt that tuberculosis as an occupational hazard of medical students and internes merited special consideration, and systematic methods for early diagnosis should be instituted.

(3) *Medical Education*—Co-operation with the faculties in raising the standard of medical education, and the establishment of a standing committee on curriculum were recommended.

(4) *Book Co-operatives*—It was felt that the establishment of co-operative book stores should be considered in the light of conditions at the individual schools.

(5) *National Scholarships*—The possibility of national scholarships for medical students was discussed.

(6) *Interchange of Ideas*—Co-operation and interchange of ideas between the medical schools of Canada, and with the A.M.S., should be fostered by correspondence, and syndicated articles in the local journals.

(7) *Internes*—The function of internship as an integral part of medical education was stressed. It was recommended that the C.A.M.S.I. co-operate with the Department of Hospital Service in implementing their suggestions with regard to interne health, education, honoraria and uniform appointments.

(8) *Advisory Board*—Formation of an advisory board of interested faculty members and graduates to make up for undergraduate inexperience, was felt to be highly desirable with this tentative programme, the delegates were instructed to organize local branches in their respective schools, and a national committee resident in Toronto was appointed to carry on nationwide organization and arrange for the next conference. A very favourable response was obtained, with branches being formed in all the original four colleges and great interest being shown by the other Canadian Medical Schools, including the two French-speaking universities in Quebec.

In the summer one of the resident executive met the executive of the Association of Medical Students, and the basis was laid for broad co-operation between these two organizations with similar aims and problems. It was agreed that the Journal of the A.M.S. should continue to be sent to every medical student in Canada, and contributions to it from the

C.A.M.S.I. were invited. Co-operation between committees considering similar problems was welcomed as being to the mutual advantage of both.

An extensive survey of the tuberculosis problem was also conducted during the summer.

At Toronto interest has centred around tuberculosis and student health. The institution of a system of routine chest plates for all positive reactors among the medical students is very gratifying. Each anatomy table and clinic group was asked to appoint a representative to the local C.A.M.S.I. organization. A well attended meeting of these representatives was held in October to consider the problem of student health, and to institute a survey of illness among the students over the past year. The co-operation of everyone in this important work is urged.

The response from the other medical schools has been very encouraging and a national conference at Toronto is being planned for January 28, 1939.

BIRTH PALSIES

By CRAWFORD B. SHIER, '40

Any part of the central nervous system of the child can be injured by accidents during delivery. Rupture of tissues will be the result of excessive stress upon any part of the foetus. Such tissue injuries are diffuse and variable and structures will be involved in accordance with their anatomical situation rather than their function. Disturbances of function will usually not be progressive.

However, since obstetrical procedures in cases of difficult labour are fairly uniform, birth palsies may be classified as follows:

Palsies due to brain injury.

Palsies due to spinal cord injury.

Palsies due to injury of the seventh cranial nerve.

Palsies due to injury of the brachial plexus.

Palsies Due to Brain Injury

1. *Etiology*: The *predisposing causes* of cerebral injury:

(a) Contracted or malformed pelvis, rigid soft parts, precipitate or prolonged labour, abnormal presentation, high forceps deliveries, breech extraction or very large foetal heads because these are conditions which increase the stress which the foetal head must sustain in its passage through the birth canal.

(b) Asphyxia increases bleeding from torn vessels by causing congestion.

(c) Prematurity predisposes to haemorrhage in the new-born because the blood vessels are abnormally fragile; also the premature infant's skull is very thin and favours excessive moulding and intracranial injury.

(d) Delayed coagulation time will prolong oozing from a small torn vessel until a large haematoma has been formed.

(e) Syphilis and other diseases of the foetus may or may not be predisposing causes.

The *exciting cause* is intracranial haemorrhage. The commonest type of haemorrhage which is found over the convexity in the subdural or, less frequently, the subarachnoid space is due to over-riding of the parietal bones and tearing of the tributary veins to the longitudinal sinus. These veins are very fragile and stretch between their fixed attachment to the sinus and the relatively unfixed brain. Some cases may be due to tearing of the longitudinal sinus. Sometimes in breech extraction there is a similar overlapping of the parietal bones over the occipital bone and tearing of the lateral sinus or neighboring veins which empty into it. If the moulding of the head is excessive dural tears may occur, due to stretching of the falx and tentorium, and haemorrhage from ruptured veins will result.

2. *Pathology*: *Early*—In autopsies on the new-born large intracranial haemorrhages are not infrequently found in large obstetrical hospitals. They are found over the convexity or at the base with about equal frequency. They are usually subdural but sometimes they are subarachnoid. When the haematome is over the convexity it is unequally bilateral in about 50% of cases, and unilateral in the remainder. If the blood diffuses throughout the subdural space no softening of the cortex occurs. On the contrary, local haematomas may occur and cause cortical softening. Large haemorrhages at the base spread with ease throughout the meningeal spaces.

Sometimes large extravasations into the brain substance are found, and minute haemorrhages into the central grey matter and brain-stem are not uncommon. One may also demonstrate degenerations and focal necroses on the surface of the cortex. There may be haemorrhages in the retina and internal ear.

Late—There is no general agreement about the late morbid anatomy of intracranial birth injuries.

Probably the diffuse type does little damage to the cortex. It may cause increased intracranial pressure and death or is absorbed with no injury to cortex. Slight thickening of the dura mater occurs in the case of diffuse subdural haematoma, and thickening of the meninges would apply also to the diffuse subarachnoid haematoma at the base of the intracranial cavity. The meninges may contain traces of altered blood pigment.

One would expect the localized or encapsulated haematomas over the cortex to leave a more severe mark on the patient's brain. These haematomas would likely result in local atrophy and sclerosis of the underlying cortex with thickening and perhaps cyst formation in the affected overlying meninges.

Intracerebral cavities may be found, resulting from cortical haemorrhage and necrosis and containing altered blood pigment in the walls, or from periventricular extravasations. The latter are bilateral and are separated from the ventricles by a thin membrane.

Some authors state that in some cases hydrocephalus and haemorrhagic pachymeningitis are related to intracranial haemorrhage at birth.

3. *Signs of Birth Injury Resulting in Intracranial Haemorrhage*:—The child will be stillborn if the haemorrhage is extensive. If the child is alive, it may be deeply asphyxiated and difficult to resuscitate, but this occurs in many newborn babies. The "pallid asphyxia" is very serious and is due to vasomotor collapse, the result of injury to the medulla.

If respiration is established, the child is sluggish, unresponsive, and perhaps restless; does not nurse, cries feebly; respirations are slow, irregular and there is often some cyanosis. The pulse, although usually slow, may be feeble and rapid.

If there is bleeding over the cortex, there may be local muscular twitchings, perhaps general convulsions, rigidity and retraction of the head in some cases.

The fontanelles may bulge. The eye signs are the unequal pupils, nystagmus, strabismus and sometimes exophthalmos. Spinal fluid is bloody and the pressure is increased.

The signs may not become manifest until the third or even the fifth day. Very often, the only positive sign present is the increased intra spinal pressure and blood in the fluid. However, it has been shown that blood in the newborn spinal fluid occurs in 10% of all babies.

The patients may even die from this condition at 10 days or even six weeks later and yet show no evidence of birth injury until examined at autopsy.

Brain tracts are not all myelinated at full term which is undoubtedly the reason for lack of signs associated with the intracranial haemorrhage of the newborn. Yet, convulsions and local twitchings which sometimes result from cortical injuries, suggest that the cortex is not entirely insensitive to irritation.

4. *Prognosis*:—Most cases which show definite clinical signs of intracranial haemorrhage die within a few days. Cases with lesions of the central nervous system between the level of the tentorium and phrenic nuclei will be fatal in almost every instance also. Rupture or

lacerations of large veins and dural sinuses usually mean death to the patient. Those who have small supracortical haemorrhages have the best prognosis. Of the few infants who survive moderately large intracranial haemorrhages, a few recover completely, others develop spastic palsies which are sometimes known collectively as "Little's Disease."

5. *Treatment*:—For the immediate treatment of increased intracranial pressure, many authorities advocate early lumbar puncture. This may be supplemented by ventricular puncture and by transfusion if there is adequate evidence of prolonged coagulation time. There is much doubt concerning the advisability of opening the skull later to remove the haematoma. Many surgeons perform such an operation only as a desperate measure.

Following the study of the individual's requirements, proper orthopedic procedures and patient education may restore certain patients to efficiency.

6. *The Relation of Cerebral Birth Injury to Spastic Paralysis*:—Diplegia is the commonest type of cerebral paralysis, producing spastic weakness affecting the legs more than the arms or else the legs only. In the severe cases there is a general rigidity of the extremities and bulbar palsy evident at birth. In the mild cases the patients walk on the toes and spasticity is slight and evident in about six months. Diplegia is usually associated with some degree of mental defect and sometimes with epilepsy and microcephaly. In rare cases, choreiform, athetotic, flaccid and ataxic forms take the place of the more common spastic type.

These diplegias which constitute about 80% of all infantile spastic palsies are not due to birth injury as was formerly thought but due to pathological processes of intrauterine origin. Ford has done excellent work in showing the truth of this latter statement. The principle arguments in support of this fact are the following:

(a) Meningeal haemorrhage is either unilateral or when bilateral it is unequal; cerebral diplegias are practically always bilaterally symmetrical.

(b) In cerebral diplegia the commonest pathological picture is a diffuse symmetrical atrophy of both hemispheres with the destruction of neurones and the proliferation of glial tissue. The meninges are unaffected. At other times a slight defect can be seen in the pyramidal tracts. In other cases, simply convoluted brains indicate an arrest in development in the early months of foetal life; such are not the findings in cerebral birth injury.

(c) The heads of diplegics are not uncommonly microcephalic and usually at least slightly below size; intracranial haemorrhage causes a rapid enlargement of the head and bulging of the fontanelles.

(d) Children who are known to have had definite intracranial haemorrhage at birth or in infancy do not develop cerebral diplegia.

To recapitulate, true cerebral birth palsies are included in hemiplegias, monoplegias and unequal bilateral paralyses.

These children have enlarged and frequently asymmetrical heads and there is nearly always a definite history of birth injury obtained. It is also likely that unequal congenital defects of the brain are included in this small group also, but they will be a small proportion of the group.

Thus the latest opinion according to Ford and others on this matter is that only about 6% of infantile cerebral palsies are due to birth injury; the great mass of infantile palsies can no longer be lightly attributed to faulty obstetrical procedures.

Palsies Due to Spinal Cord Injury.

In a suprisingly large number of cases of difficult extraction where the most obvious disability is paralysis of an arm, critical studies produce evidence that the spinal cord is also involved; but many cases occur below the level of the brachial plexus.

Injuries to the cord at or above the level of the third cervical vertebra thus involving the phrenic nuclei are obviously not of clinical interest and will not be included in this paper.

The spinal column of the infant consists of a series of elastic rings which are connected by relatively brittle discs and ligaments. The dura mater lies within the vertebral canal as a tube firmly fixed to the column in the cervical and lumbar regions. The cord is anchored by the brachial plexus above and by the cauda equina below, and it is inelastic and friable. Thus excessive elongation of the child's body during birth, especially in breech extraction may put intolerable strain on the cord or upon the meninges or both, between the two points of anchorage. Hyper extension and torsion are also forces which may cause harm. Fracture dislocations in the cervical region are not uncommon, and they may or may not involve the central nervous system. Since most of the latter are high enough to prevent initiation of breathing if the cord is injured, they are of little importance in relation to the clinical disturbances to be considered.

Head and Riddoch proved that, in general, transections above the lumbar enlargement did not usually abolish reflex activity of the isolated portion of the cord.

Often the diffuse nature of the lesions makes accurate focal diagnosis difficult and relatively futile

Disability in the spinal cord injuries is only progressive in the cases of contraction of scar tissue or infection.

In view of the fact that any level of the cord may suffer injury in any degree it is clear that no series of discrete syndromes will be produced. With the meager details available no etiological classification is possible. Evaluation of various types of sensory disturbance, reflexes, etc., which is of great value in studying adults, is useless in children. However, children can be studied fairly satisfactorily by behaviour, and such signs can be used to establish the spinal origin of the disturbances. Crothers and Putnam used this method with satisfactory results. Transection or destruction may occur completely or incompletely across the cord.

There may be transection of the cord with or without reflex activity below the lesion. There may be severe cord injury with anaesthesia, loss of sphincter control, trophic ulcers, flaccid paraplegia, and perhaps sweating above the level of the lesion. There may be incomplete transection of the cord with persistent reflex activity, slight and temporary voluntary activity. There may be high physiological transection with death later, and minimal reflex activity. The cases of complete transection usually develop bladder infection.

Palsies Due to Injury of the Seventh Cranial Nerve.

This palsy is usually due to compression of the facial nerve branches where they pass through the parotid gland, the end of the forceps blade making pressure on the nerve branches in that location. This is usually unilateral and rarely causes permanent paralysis. This type may occur due to pressure of the bony pelvis on the face during parturition.

It is noted at birth that only the unaffected side of the face is contracted when the baby cries, the affected side of the face remaining smooth and the eyelids open. The unrestrained facial muscles on the unaffected side draw the mouth away from the affected side.

For treatment the child will have to receive its nourishment by means of an artificial feeder if unable to suck. Function usually returns to the affected side of the face in a few days or weeks depending upon the severity of pressure upon the nerve.

Palsies Due to Injury of the Brachial Plexus.

There is more or less complete paralysis of an upper extremity resulting from injury to the brachial plexus or its roots during parturition.

1. *Etiology*: The *predisposing causes*: (a) Disproportion between the size of child and parturient canal to such an extent that labour is difficult.

(b) Hastening of labour by the use of manual traction or instruments. This is more especially true when such a force pulls the head and neck away from the

shoulder causing stretching of the plexus.

(e) Breech delivery carries a heavier incidence than vertex delivery according to Alfred S. Taylor and others.

(d) Cyanosis, where prolonged second stage and similar conditions reduce the resistance of the nerve trunks to overstretching. This occurs in large sturdy children.

(e) Prematurity or malnutrition, where diminished resistance of the nerves does not tolerate ordinary stretching.

The exciting causes are forms of trauma. (a) The chief type and perhaps the only type of overtraction on the nerve roots and trunks. Forceps could not possibly cause the type of injury found on dissection of these cases, and during traction could not possibly reach down to the site of injury (C.1 to Th. 1) as they only get purchase on the skull.

(b) Squeezing of the nerves against the first ribs by the clavide has often been offered as a direct cause. Experiments on cadavers have shown that the nerves invariably slide away from the grasp of the two bones and do not get pinched. It has also been found impossible to elevate the clavicle so as to cause pressure at the most common site of injury, namely the junction of the fifth and sixth cervical roots. However, overtraction on the same specimens by pulling the shoulder down and the head and neck in the opposite direction tore the nerves in precisely the same manner as the findings on the dissection of living children.

(c) Fingers, during breech delivery, if flexed and hooked over the shoulders, may cause direct pressure on the tense nerves at right angles to the plexus and thus precipitate rupture.

2. *Pathology*: The degree of injury will depend upon the energy and duration of traction applied and the resistance of the structures. Where traction is of the minimum force and duration that will cause paralysis whatsoever, there results no anatomical lesion but rather a physiological block which entirely disappears within a few days. Where traction is of extreme force and duration, there will result evulsion of the whole plexus from the spinal cord or rupture of the whole plexus. Between physiological block and complete rupture, any degree of injury may be found.

The damaged nerves fray and pull apart as does an old rope when stretched, rather than divide in a clear-cut transverse plane. There is usually a frayed-out bridge and only rarely do the ends of the damaged nerve entirely separate.

Early Morbid Anatomy: There is laceration of the deep cervical fascia, scalene muscle, nerve sheaths and nerve fibers.

The rupture may occur at the emergence from the cord (evulsion) or at any point distal down to the trunks leaving the plexus. Not all the fibers in the same nerve rupture at one level, and not all the nerves or fibres need necessarily rupture. Finally the entire area of damaged fascia, muscle and nerve is infiltrated with blood from the damaged vessels in these structures. In cases of application of traction in delivery, the upper roots and plexus suffer first and most, and give the *Erb-Duchenne* type of brachial palsy. In a few cases, as the result of traction on a hyper extended arm in a breech case, the maximum injury occurs to the lower roots and gives the reversed or *Klumpke's* type of brachial palsy.

In time the damage to these tissues, bathed in blood, is repaired. The damaged nerves develop neuromata and fibrous tissue, the muscle and fascia while cicatrizing become firmly adherent to the nerves, and this scar tissue infiltrates the damaged nerves. Consequently, there is serious obstruction to the spontaneous regeneration of ruptured nerves as well as to the transmission of impulses along any remaining unruptured fibers which suffer constriction.

Late and Secondary Morbid Anatomy: Development of the extremity as a whole is retarded and especially of the scapula, humerus, and shoulder joint. Muscles fail to develop in proportion to the injury of nerve supply. Thus may secondary changes occur: Subluxa-

tion of the shoulder joint; contractures of the inward rotators of the humerus, flexors of the elbow, pronators of the forearm, flexors of the wrist and digits, adductors of the wrist; changes in bony conformation of the elbow joint preventing complete extension; cervico-thoracic scoliosis in some cases.

When evulsion occurs there is very great atrophy of corresponding muscles. When the eighth cervical and first thoracic roots are evulsed from the cord or seriously injured the communicating branches of the sympathetic system are torn and changes occur in the ipselateral eye known as *Horner's syndrome* (slight enophthalmos, slight ptosis and slightly smaller pupil).

3. *Symptomatology*: The symptoms will depend upon:—

Nerve injury.

Contractures due to muscle imbalance.

Failure of bone growth from nerve injury and lack of use. The palsy is detected immediately after birth. There is pain when the damaged extremity is manipulated until the end of three or four weeks when the active stage of traumatic neuritis subsides. However, there may be sensitiveness to direct pressure over the damaged nerves for an indefinite period of time.

The rupture of one root will cause complete paralysis of a muscle deriving innervation from two or more roots. In sharp contrast we find that the nerve trunks derived from the plexus carry fibers from various roots to synergistic groups of muscles, so that section of the trunk causes complete paralysis of its circumscribed synergistic group.

Although we see that almost infinite variations in degree of injury can occur and therefore in symptomatology, for descriptive purposes we may consider the degrees of injury to fall into four groups in the Erb-Duchenne type and a fifth group for the reversed or Klumpke type.

(a) *Erb-Duchenne Type.* (i) Very slight cases are due to overstretching of the upper nerves without laceration. There is loss of power, either complete or partial, in the shoulder-cap group of muscles. Addnction at the shoulder, and external rotation of arm are more or less completely lost. Flexion of elbow and supination of forearm may show slight interference of function. Recovery of the fifth and sixth cervical roots occurs spontaneously in five days to three weeks.

(ii) Upper arm type or moderate cases: This is the result of overstretching with laceration of the fifth and sixth cervical roots of the brachial plexus and the neighbouring tissues. There may be overstretching and possible laceration of the seventh cervical root and more or less overstretching of the eighth cervical and first thoracic roots may occur in some cases. The majority of cases are included in this gronp and the diagnosis is made at birth.

There is flaccid paralysis of the extremity at first which is later followed by contracture of muscles to take up the typical posture. The entire extremity is paralyzed except for digital movements and often slight movement at the wrist, with flexion stronger than extension.

The extremity lies straight down along the side, because the triceps and anconaeus muscles are not completely paralyzed, while the biceps, brachialis, and brachio radialis muscles are paralyzed. The arm is inwardly rotated because the humeral portion of the pectoralis major muscle and latissimus dorsi muscle are not completely paralyzed, but the infraspinatus, teres minor, and deltoid muscles are paralyzed. The forearm is pronated because the pronator quadratus is not usually paralyzed while the supinator, biceps, and brachio radialis muscles are paralyzed.

(iii) Severe type: All roots of the brachial plexus are seriously injured. The upper two or three roots are badly lacerated and occasionally ruptured with displacement of the ends The lower two roots are lacerated but not often ruptured completely, and will show Horner's syndrome. One or more roots may be avulsed from the cord. All muscles are thin and flabby, the shoulder is a flail joint. Primarily there is a flaccid

paralysis, but some nerve regeneration may allow the use of the muscles controlling the digits and slight movement of the wrist after several months.

(iv.) Complete: All roots are so badly lacerated and ruptured that the resulting scarring entirely prevents spontaneous nerve regeneration. Frequently the upper one or two roots are evulsed from the cord. There is complete flaccid paralysis of the extremity which never shows any spontaneous recovery. The muscles do not develop, but remain thin and flabby, the bones fail to grow at the normal rate, and a symmetry between the normal and abnormal extremities increases with the growth of the child.

After some time the extremity hangs uselessly by the side, the palm facing medially, the wrist, hand and metacarpophalangeal joints straight, fingers flexed at the interphalangeal joints. The skin is thin and shiny; the tissues are atrophic but very often swollen with a hard oedema.

In a few cases the eighth cervical and first thoracic roots are evulsed from the cord, or damaged close to the intervertebral foramina, so that the communicating branches of the sympathetic are ruptured. This results in Horner's syndrome.

(v.) *Reversed or Klumpke's type*: It is only occasionally seen, the lower two or three roots being damaged while the upper roots escape. The shoulder and elbow function is good but the hand and wrist are useless. Horner's syndrome is present because the communicating branches of the sympathetic are in the eighth cervical and first thoracic anterior primary rami.

Sensory examination of infants is unsatisfactory. Although there is overlapping in distribution of sensory nerves, sometimes it is possible to detect anaesthesia when only two posterior roots are involved. Often the area of anaesthesia is a heart-shaped one over the outer aspect of the deltoid muscle, due to the involvement of the fifth and sixth cervical roots alone. With progressive damage downward the area of anaesthesia or sensory changes become more widespread and definite. If all roots are ruptured there will be complete anaesthesia except for the small area on the inner arm in the arm pit region supplied by the second thoracic posterior root.

4. *Sequelae of Untreated Cases*: As the child grows older certain new objective findings develop if not properly treated from the time of birth.

A posterior subluxation of the shoulder joint occurs usually after six months, except in Klumpke's type.

In all cases in which spontaneous recovery has not occurred by the end of six months (except in Klumpke's type) the paralyzed extremity will be somewhat shorter and smaller in size. The bones fail to grow properly due to lack of stimulation of growth which would have followed normal activity of the muscles attached to them. The clavicle is smaller in diameter and length. The scapula is also smaller. The head of the scapula rotates outwardly causing the glenoid fossa to look more downward and outward than normal. This results from paresis of the serratus anterior muscle giving a so-called "wing scapula." The outward and upward swing of the upper angle of this bone causes the middle of the trapezius muscle to become prominent.

When the time for walking comes, the difference between the two upper extremities in size, weight and mobility causes serious interference with the capacity to balance during standing and locomotion, so that these children fall more than normally, especially when they attempt to run. In older children with persisting Erb-Duchenne type of paralysis, lateral scoliosis of the cervicothoracic spine often occurs with the concavity towards the paralyzed side, in the body's effort to restore balance.

Shortening contracture of the teres and subscapulas muscles occurs because, their antagonists being paralyzed, they are never spontaneously put through their proper range of motion and stretching. So range of motion is lost even after nerve regeneration.

Slight flexion of the elbow joint occurs as well as pronation of the forearm due to three factors:

(a) Maldevelopment of the bone ends making up the elbow joint, resulting in contact between humerus and olecranon before extension is complete.

(b) Shortening of the anterior ligaments of the elbow joint.

(c) Contracture of the unresisted pronators.

The wrist and hand assume a flexed posture with some ulnar adduction due to the unresisted flexor carpi ulnaris and flexors of the fingers.

In cases of complete sensory loss, trophic disturbances are common, especially involving the digits and hand.

5. *Diagnosis is made on*: History of difficult labour. Unusually large child or small pelvis or both.

Typical attitudes as described under the types.

Tender swelling over plexus or paralyzed side.

No evidence of intracranial or spinal cord injury except in rare instances where there is an added complication.

No bone trauma except as a rare complication.

Paralysis of radicular type rather than peripheral nerve trunk type.

6. *Treatment has two fundamental phases*: (a) The prevention of contractures and deformities by proper physiotherapy.

(b) The promotion of nerve regeneration:

(i) Spontaneous, by posture, physiotherapy for six to twelve months.

(ii) Where spontaneous regeneration is unsatisfactory after six to twelve months, surgical repair is indicated.

From the results tabulated there can scarcely be a question that in properly selected cases surgical repair to the plexus will give results obtainable in no other way.

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TREATMENT IN CONGESTIVE CARDIAC FAILURE

By C. W. TAYLOR, '40

It is probably safe to say that no two patients suffering from congestive cardiac failure will present the same problem. Every patient is different in his or her constitutional, physical and mental qualities and must be dealt with appropriately. Symptoms manifested will differ in severity and quality, and must be treated accordingly. Common sense, good judgment and tact must be exercised in every case.

In treating congestive cardiac failure, we must consider (1) Causation and aggravating factors (2) Rest (3) Diet (4) Drugs (5) Venesection (6) Other measures.

Causation and Aggravating Factors

The *common causes* of heart failure are:—Rheumatic fever, coronary arteriosclerosis, hypertension and syphilis. In these cases nothing can be done to remedy the underlying causes and treatment must be directed towards relieving the failing heart as much as possible and making the patient comfortable by the means about to be indicated.

Less common causes include diphtheria, myxoedema, anaemia, beri-beri, etc. Here medical treatment must be aimed at the underlying cause and not at the failing heart, if we expect to obtain results. Failure due to thyrotoxicosis, constrictive pericarditis, arterio-venous fistula, etc., responds remarkably when appropriate surgical treatment is directed towards eliminating the condition. In spite of their rarity these causes should be constantly searched for.

Aggravating factors are too important to be overlooked. They include obesity, anaemia, pregnancy, over-exertion, focal infections, coughing, respiratory infections and severe mental stress.

We now turn to the treatment of congestive failure itself.

Rest

Failure with congestion is one of the few manifestations of heart disease that calls for treatment in bed. Rest for the body, rest for the heart and rest for the mind are essential. But like any other potent therapeutic measure, rest can be easily overdone. A patient whose only symptom is breathlessness on a degree of exertion previously carried out with comfort, would be well advised to spend a few days to one week in bed to allow the heart to recuperate. After that he may be allowed up to resume his customary activities provided he never indulges in an amount of exertion producing breathlessness. If, however, putting him to bed would cause him to worry and fret about his condition this should not be insisted upon. If in addition to breathlessness on exertion, swelling of the feet and ankles be observed, this indicates a more severe degree of failure. Such a case should stay in bed for at least two or three weeks after all signs of failure have disappeared. At the end of this time if the patient feels well, he may be allowed up carefully. Exertion should be indulged in only gradually, in order to determine just how much the patient can stand before dropsy and dyspnoea return. Having determined this exercise tolerance, the patient must carry on within it.

If, however, the patient shows the familiar signs and symptoms of congestion at rest, viz., dyspnoea, fatigue, oedema of dependent parts, enlarged and tender liver, ascites, pleural effusion, cyanosis, venous engorgement, etc., absolute rest is essential. Careful nursing should guard the patient against effort of all kinds. He should remain quiet in bed in a comfortable position, usually with the head well raised. He should not lift himself or change his own position. He should not wash, dress or feed himself or lift himself on or off the bed-pan. He must be discouraged from talking beyond indicating his immediate wants, and from attempting to assist the nurse who moves him.

These precautions against effort may

be relaxed as improvement occurs. The patient may be allowed up beside the bed in about a month after all signs of failure have disappeared. He may walk to the bathroom and other light exertion may be indulged in, if it does not produce dyspnoea. A prolonged stay in bed after the patient has thus far convalesced predisposes to pneumonia and to infarction of the lungs, and should be avoided.

Diet

In cases of incipient failure, full diet is allowable. If marked oedema be present, fluids should be restricted to 800 cc. per day and salt intake should be curtailed. The amount of food taken should be cut down so as to just supply the individual's requirements. This will place a minimum of strain upon the heart in metabolizing it.

If the patient be severely congested, it is wise to feed him one glass of milk four times a day for from two to four days. This will provide him with 800 cc. of fluid and a minimum of easily digested food. After this the diet should be small in quantity, restricted in salt, easily digested and administered in five fedings rather than three. The evening meal should be the smallest. After the patient has become ambulatory, an occasional day on the milk diet plus one of the xanthine drugs is of aid in diminishing any tendency towards oedema formation.

Drugs

Digitalis is indicated in nearly every case of digestive failure, except in the rare instance of accompanying partial heart block. The guide to the dosage of digitalis in fibrillating patients is the heart rate. This should be maintained between 70 and 80 unless the patient be feverish, when it should not be allowed below 90 or 100.

Solid preparations of the whole leaf of digitalis are decidedly to be preferred to liquid forms which deteriorate and whose dosage is difficult to measure. Since the effect is cumulative, large doses are given at first, until the desired effect is produced. Then the patient is carried along on the minimum dose which will keep the heart rate normal. An average case will require about 1½ grains three times a day for from 2 to 4 days, to bring the rate down without symptoms of intoxication. Then about 1½ grains daily will usually carry them on. Individuals vary markedly in their response and these doses will need to be varied accordingly. No hard and fast rule can be laid down.

The most common manifestations of digitalis intoxication are anorexia, nausea and vomiting. These symptoms never develop following the administration of the drug unless the therapeutic dose for the particular patient in question has been exceeded. Therefore, to avoid this, other drugs which might cause nausea and vomiting should be withheld during the first few days of digitalization. Other manifestations of digitalis intoxication are extrasystoles, yellow vision, diarrhoea, mental apathy and depression.

Frequently even patients who are not fibrillating will be benefitted by tonic doses of digitalis. The patient is given digitalis as above until the heart rate begins to drop or symptoms of intoxication appear. He is then given a dose of about 1½ grains a day, the actual dose again being guided by the heart rate.

Adequate sleep is essential in every case of heart failure. If the patient does not get at least six hours sleep at night a sedative should be prescribed. The mildest one that will achieve this should be used. Codeine ½ grain plus aspirin 5 grains given three or four times a day with a double dose at bed-time may be tried. Phenobarbitone may be given in doses of ½ to 1½ grains at bed-time. Sodium bromide and chloral hydrate of each 15 to 20 grains is a well tried and excellent hypnotic mixture. It occasionally induces nausea and vomiting and should not be repeated in this circumstance.

Where these drugs fail, or where sleeplessness is associated with pain or much breathlessness, morphia 1/6 to 1/4 grain should be used. Where it is associated with irritating but ineffective coughing, codeine phosphate 1/4 grain may be given by mouth.

If diuretics are required, salyrgan or other mercurial compounds may be given intravenously in doses of 1 to 2 cc. at intervals of days or weeks as needed. The action of these drugs is enhanced when acidifying salts such as ammonium nitrate 15 to 20 grains, 3 or 4 times a day are given at the same time. Mercurial diuretics should not be given to patients with gross haematuria or renal insufficiency. Albuminuria, however, is not a contra-indication.

Xanthine diuretics are sometimes of value, especially theophylline which never produces permanent harm, but sometimes produces nausea and vomiting. It is best given after meals in doses of 5 grains three to five times a day. Patients who cannot tolerate this, may be tried on less potent but less nauseating xanthine drugs. These compounds are of particular value in preventing the return of oedema in patients who have once had it. Such individuals should weigh themselves daily and take theophylline whenever the scales show a tendency towards a rapid increase in weight. By this means many subjects who otherwise would be in a state of chronic invalidism can be maintained at a restricted level of activity for months or even years.

Recent evidence indicates that oedema is not only an unpleasant symptom, but may actually aggravate the disease process. If this be true, then in vigorously combatting oedema, one is doing more than merely treating a symptom. Diuretic drugs are also useful in subjects whose oedema is limited to the lungs. Particularly is this so when the rales fail to disappear after sufficient rest and adequate digitalis therapy. Oedema fluid is an excellent culture medium, and in the lung it predisposes to pneumonia, which is one of the chief causes of death. It also increased dyspnoea. Consequently it is a distinct advantage to eliminate it if possible.

Saline purgatives (magnesium sulphate 1 drachm in water in the morning) may be given to the more acutely congested patients so that straining at stool is avoided. Two movements daily of the bowels or one if full, is adequate. Patients should not be drastically purged, however, even if oedematous.

Venesection

Authorities disagree in their evaluation of venesection in congestive cardiac failure. Venesection may be carried out in cases in which the venous engorgement amounts to 8 cm. or more excess pressure. This may be roughly determined by measuring the distance of the hand above the auricles, at which the veins just collapse. Normally the veins of the hand collapse at auricle level. Obvious anaemia contraindicates its use.

This is best accomplished by having the whole arm and hand thoroughly warm to relax the veins and produce ample blood flow. A rubber band is tied around the upper arm at a pressure occluding veins but not arteries. A large needle is inserted into one of the large veins at the elbow and blood drawn off. In an adult of medium weight (140 lbs.), 250-550 cc. of blood can be taken according to the severity of the congestion.

This procedure usually lowers venous pressure considerably by the withdrawal of fluid from the venous reservoirs. A decrease in the fullness of the cervical veins is almost always seen and a diminution in the size of the liver is often detectable.

Very soon fluid is taken by the blood from the tissues spaces. The blood becomes diluted and therefore less viscous. This reduction in viscosity is probably one of the chief beneficial effects of bleeding because it increases the flow of blood through the tissues and vital organs. Patients will almost always speak of relief both from breathlessness and from the sense of tension in the head. Sleep becomes easier to obtain.

In cases that react most favourably, venous pressure remains low after bleeding. More often it will be found to be raised again although not to the original level. If the rise in level continues, another bleeding of 250 cc. a

week or ten days after the first may be required. In the most obstinate cases, three or four venesections may be needed within four to six weeks.

Other Measures

For pain over an engorged liver, local application of an ice-bag or of irritants such as a mild capsicum plaster or antiphlogistine are of value. Failing this, morphia is the final and best remedy for precordial pain.

Where cough is the result of an associated bronchitis the expectoration of stiff mucus is helped by stimulants such as ammonium chloride. Where it is the result of commencing congestion and oedema, sedatives such as codeine are more suitable. The object in the former case is to decrease the effort of coughing, in the latter, the amount.

In the acute or terminal stages, oxygen administration sometimes affords a little relief from breathlessness. It should be delivered by a nasal catheter passed well back. The gas should be first led as a continuous stream of bubbles through warm water, as a stream of dry gas is not tolerated.

Stimulants such as caffeine, coramine, etc., may be used to advantage in encouraging the heart and respirations to hold out to the very last. When even these fail, morphia will alleviate the terminal dyspnoea and distress.

Summary

(1) The cause should be ascertained and treated if possible.
(2) Aggravating factors should be guarded against or eliminated if possible.
(3) For patients with incipient failure and no fibrillation, tonic doses of digitalis plus a short period of rest in bed should be advised. Then they should carry on within their exercise tolerance.
(4) For patients with more advanced failure plus dropsy; (1) rest in bed for 3 weeks after symptoms of failure disappear (2) diet low in salt and fluids (3) digitalis.
(5) For patients with marked congestive failure. (1) absolute rest in bed. (2) soft diet low in amount, fluid and salt. (3) digitalis, diuretics and hypnotics. (4) venesection.

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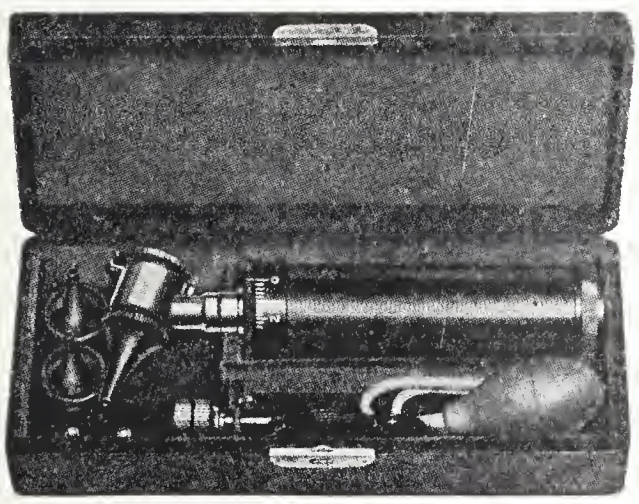

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STERNAL PUNCTURE AND BONE MARROW.

By PAUL GREENBERG, B.A., '40.

Within recent years it has been realized that the so-called "diseases of the blood" are really diseases of the blood forming and blood destroying organs. It was not so long ago that the hematologist, Turck, is reputed to have answered a question in pathology by the declaration that he was "a peripheral hematologist." Jaffe, however, points out that "the circulating blood does not always reflect the condition of the bone marrow."

With this thought in mind there has been an attempt to perfect methods which would make the study of the bone marrow of the patient available to the physician. In 1908, Ghedini published the first study on biopsy of tibial marrow. He recognized its value in the diagnosis of leishmaniasis and latent malaria. Further work subsequently followed, and reports appeared on marrow studies in pernicious anemia and other blood dyscrasias. A Russian, Arinkin, in 1927, first advocated aspiration of sternal marrow through a spinal puncture needle, a method which is gaining considerable support and some condemnation, from both sides of the Atlantic.

Advantages.

The older method of obtaining marrow was by biopsy. It is true that here the cells are seen in situ and therefore the structure of the marrow is appreciated instead of merely the cytology. However, there are few cases where this is of any value over the aspiration method. The latter has the advantage of being a very minor procedure requiring little skill or time, and causing the patient little discomfort instead of being a surgical operation. It leaves no scar. It can be used repeatedly on the same patient to study the progress of a disease or the response to therapy. There are no sequelae. The smear is at once available for diagnosis.

Less than 2% of the attempts are unsuccessful and these are usually due to thickened sternum or fibrosis of the marrow.

Technique.

There are several modifications. A good method is: The skin over the sternum is prepared with iodine and alcohol. 2% novocane can be injected over the site of the needle insertion but is not necessary. The needle is an 18 gauge spinal puncture needle with stylet, preferably shortened to 2 inches. It is inserted at an angle of 45 degrees, pointing headward in the midline at the level of the upper border of the third rib and is pushed in until it is felt to give on passing through the outer table. The stylet is removed and a tight-fitting 10 cc. dry syringe is attached. About 1/10 of a cc. of marrow is quickly withdrawn. The needle is removed and the contents ejected onto a clean glass slide. From this a white cell count can be made and smears. The smears are stained; a combination of Jenner and Giesma is good.

The smear.—The smear will consist of cells aspirated from the marrow plus some peripheral blood which has become admixed in the aspiration. The cells will be:

those of the granulocyte series.
those of the erythroid series.
lymphocytes.
monocytes
plasma cells
reticulum cells and endothelial cells.
megakaryocytes and platelets.
hematogones (the mystery cells of the marrow).
abnormal cells: Gaucher cells, tumor cells, etc.

I will not attempt to discuss the cytology and to consider the contro-

versies that are raging in this field.

About 90% of the cells are of the granulocytic series, and the distribution of these is about:

neutrophilic myelocytes 22%.
primitive neutrophils 30%.
segmented neutrophils. 32%.
lymphocytes 7%.
megakaryocytes .2%.
hematogones less than 2%.
myeloblasts, promyelocytes, oesinophilic and basophilic myelocytes and adult basophils and eosinphils 1%.
Erythroid elements (remaining 10%).
normoblasts 75%.
erythroblasts 25%
megaloblasts 0-.5%.
Mature red cells are not counted.

Some consider that the megaloblast is a pathological cell (Pappenheim and Farrata).

Use in Diagnosis.

The pathology of the bone marrow will be considered under two headings.

1. *Where pathological cells are present.*

a. Gaucher's disease.—The typical Gaucher cells are seen. These are large, balloon-like cells with thin bluish-white cytoplasm having a fibrillar structure. Often they contain small vacuoles and the small nucleus is pushed eccentrically.

b. Malaria.—The parasites can often be found in the cells in the marrow when they cannot be found in peripheral blood.

c. Leishmaniasis.—The bodies can be seen.

d. Multiple myeloma.—There is an early increase in plasma cells which are often atypical. They may constitute almost all of the cells in the smear, and may be found before small x-ray findings are positive.

e. Metastatic carcinoma—The cancer cells can be seen.

In these conditions the smear is pathognomonic.

2. *Where there is a disturbance in distribution.*

(i) *Conditions which are reflected in the peripheral blood.* In these conditions the marrow is of use in separating a disease from conditions in which the blood does not show the same reaction as the marrow, but where it simulates the disease that does. For example, the peripheral blood may show an agranulocytosis, while the bone marrow is filled with cells of which 99% are myelocytes, and which is a subleucemic leucemia.

a. leucemias. The blood picture may be that of a leucemia, and here the marrow is confirmatory, showing an increase in the primitive cells into the leucemic range.

b. secondary anemias. There is not sufficient data available as yet to decide whether or not secondary anemias follow the marrow. Results are as yet conflicting. Some claim that except in anemia of hemorrhage the marrow in secondary anemias is within normal limits, whereas others disagree.

c. hemelytic anemia. The marrow shows a marked increase in normoblasts, which might be of considerable aid in the differential diagnosis of chronic jaundice.

d. Aplastic anemia. The marrow shows a true hypoplasia: marked decrease in all the elements. In severe cases only a few cells and some fatty material may be aspirated.

c. Hodgkin's disease infections, cosinophilias, etc., are conditions in which the cytology of the marrow is what would be expected from the peripheral blood.

In *thrombocytopenic purpura* the marrow may or may not show a decrease in megakaryocytes and platelets When a decrease is found one might consider that the fault was primarily in the marrow and that splenectomy would not give good results. In the type where there is a marked increase in megakaryocytes, the belief might be expressed that the primary disturbance was an over-functioning spleen, and good results might be expected from splenectomy. (However, there is some evidence that in both cases the spleen is at fault—but this is far from certain).

In *agranulocytosis* again there may be a decrease in the granulocytic elements. However, in some cases there is seen an increase in the myelocytic elements, as if there were a maturation factor absent, and this is a good prognostic indication.

(*ii*) *Where the Peripheral blood may not follow the marrow.*

a. Leucaemias. The subleucemic leucemias may show great marrow hyperplasia in the primitive white cells whereas the blood shows a leucopenia which may be marked.

b. Polycythemia. The erythroid elements may actually be decreased, and the predominating cell is the mature polymorph, suggesting that a maturation factor is present in excess.

c. Infectious mononucleosis. The marrow here is essentially normal, showing some increase in lymphocytes, so that a sternal puncture may prevent an erroneous diagnosis of leucemia.

d. Pernicious anemia and sprue. There is a marked increase in megaloblasts and erythroblasts with frequent mitotic figures if the marrow is seen during remission. It is interesting to note that after liver therapy the megaloblasts are rapidly replaced by normoblasts. Segerdahl believes that this maturation takes place within 24 hours. Many believe that megaloblasts in large numbers are pathognomonic of these conditions, but others point out that an increase has been noticed in severe sepsis, agranulocytosis, leishmaniasis, tuberculosis, Gee's coeliac disease and hemolytic icterus.

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Feature Section

J. C. McCULLOCH, EDITOR

MEDICAL OPPORTUNITY IN CHINA

By R. B. McCLURE, M.D. (Tor.), F.R.C.S. (Eding.)
(Associated with the International Red Cross in China)

There are many younger men in Canada to-day who, as ever, cast their eyes on other lands with a view to finding an opportunity for medical service combined with some adventure. The great contributions already made by Canadian doctors in other countries justify our making an early survey of the future possibilities in this line. One country where a great Canadian contribution has been made is China.

There are several lines of work in China that may prove attractive to the young graduate. First let it be said that there is little opening for the unqualified man. Whatever line attracts one's interest it is important that the young doctor be well qualified. The idea that China represents to any young doctor a field of four hundred million guinea pigs should be dropped at once. There may have been a time when such was the attraction but it no longer holds.

Right now there is a certain demand for war surgery. Men going out for this should have a reasonable training in orthopaedics, and traumatic surgery, especially emergency surgery. There is as yet no regular organization through which such men can be sent. When once landed in China the work can be allocated by the International Red Cross. From time to time there may be organizations who would undertake the support of the young doctor. The man who, through either a sporting spirit or devotion to a

cause, wishes to undertake this war work, is offered a thrill that cannot be equalled anywhere. The work when it comes is arduous, dangerous and at times disgusting, but there is a feeling that one is doing something that no one else will do for the relief of people who have been given a rotten deal by modern science. There is that feeling that if you do not give these people help no one else will.

There are three phases of war work open to a doctor in China to-day. The public health and sanitary procedure of the refugee camps, including mass immunizations, isolations for cholera and typhoid and similar types of work with civilians who are under very strict discipline. There is also the large scale provision for maternity cases in these refugee camps. This line of work is open chiefly to women doctors. Then there is the work for the wounded, giving precedence to wounded civilians, but after they have been provided for filling up available accommodation with wounded soldiers. The lack of respect for neutral flags and the Red Cross in modern warfare, while making life dangerous also makes life surprisingly free from monotony. How long such workers would be kept on after hostilities have terminated and what funds would be available for their work is a matter of doubt.

The more regular channels of service in China are in three spheres.

Government Work.

This field is becoming more and more restricted as China finds herself with good material amongst her own students who are graduating in increasingly large numbers. Government service would include procedures in public health technique, laboratory work in provincial government medical services, plague prevention, organization of rural health in a demonstration county, demonstration tuberculosis work for schools, and similar projects. The man fitted for such an appointment would need technical qualifications suited to his position as adviser in that particular line. This is done under contract lasting from one to three years, but often renewable in some other part of the country. During the conduct of such work one would be training the staff and preparing the organization so that it could carry on after one had left.

Academic Work.

This field is a somewhat wider one and appointments are constantly being made from Canada. While in former times a thorough mastery of the Chinese language was necessary, to-day much of the teaching is done in foreign languages and English is often sufficient. An added knowledge of German would be an advantage in meeting teachers from other schools and countries. Academic work in any country is a combination of research and teaching but in most of the positions in China the teaching program will be heavier and the research given less time. The finances of this branch are restricted. Remuneration in nearly all of these positions is low. A feature of importance to anyone considering this work is that the present current of thought in student circles is much affected by the "New Life Movement" so that one finds an almost puritanical standard of morals amongst the students. Under these conditions nothing less is expected of those who are to teach.

The schools may be one of three types i.e. government schools, Rockefeller Foundation or mission schools. The work in all of them is similar. The first type of school usually has greater numbers to be trained, the second puts special emphasis on the equipment available and the research involved, while in the third —the mission college—there is usually a large number of pupils and fair equipment. Here emphasis is laid upon the spirit of the pupils, who tend to work harder than in either of the other two types of schools.

Mission Medical Work.

Most will agree that the day of the "double barrelled" missionary is past. There was a day when medicine due to lack of confidence by the local people was not enough to occupy a man's time. To-day the opposite is the case and no medical man can find the time to do his

regular work in the thorough manner that he feels it deserves. While, therefore, a man is expected to lead a decent life he does not need to have any oratorical qualifications to undertake medical mission work.

The Three Essentials Are.

1. Thorough technical qualifications before responsibility is assumed. If a man does not possess these qualifications he is sometimes allowed to work with seniors in order to gain experience.

2. Appreciation of the country and its people and an understanding of their history and their thought.

3. Ability to co-operate with other nationalities. This latter must not be motivated out of a vague sympathy for the underdog but rather out of that comradeship which alone can make true co-operation a fact. An interesting side-line such as archeology, botany or even mechanics makes life in any foreign country more livable. In mission medical work remuneration of a financial type is low, running from $1,200 to $2,200 depending on location and costs of living. The test of any work is the happiness of those engaged in it. By this standard medical mission work ranks very high. No one so engaged seems to be disappointed in his choice while the drift from this work into other lines is small.

The scope offered by this work is wide under modern conditions. Almost all missions are adopting a forward medical policy that allows of experimentation. New ideas in this field are at a premium. Old work must be carried on but new experiments in both technique and organization are taking place and are welcome.

Most missions are trying to improve their hospital facilities in equipment such as X-ray, laboratories, diathermy and similar lines. Well trained nurses and technicians are becoming available to assist the doctor. The quality of the work has risen rapidly in the past few years and everyone is keen to see it rise higher. It takes considerable driving force to bring about improvements, as one has to be able to service all improvements. While, for instance, diathermy equipment is desirable in the operating room in a land where there is much malignant tumour work, yet not every doctor knows how to service the machine, adjust the spark gap, or to diagnose a faulty condenser in the circuit. If unable to do this it is usually advisable to postpone the buying of such a machine. Such undertakings are well worthwhile and makes fascinating and interesting work.

Experiments in organization are thrilling. The working out of a system to handle tuberculosis in school children on a county-wide scale where the population may be up to half a million people, the problem of infectious diseases, wholesale immunization, medical insurance, prenatal clinics and maternity centers all offer ample scope for the ambitious young doctor. Modern medical mission policy usually advocates the doctor undertaking such experimental work as his time and energy permit. There are no hampering regulations and every offer to help meets with instant offers of co-operation from other groups in the community.

One of the interesting trends in medical mission work in China is the scheme of "zoning" of medical institutions. For instance if the doctor at "A" hospital decides that he is or would like to specialize in gynaecology then "B" decides that he will take up eye work while "C" chooses orthopaedics for his line. Then they refer major problems to one another within the zone. Once or twice a year each of the men goes on a tour to the other hospitals within the zone, while he is on call any time when a particularly interesting case in his line turns up. Under such a scheme one is able to handle the major problems of one's specialty, and take on the function of teaching the more ordinary procedures within this specialty to the other doctors whom one visits. When on furlough the mission authorities will usually co-operate by seeing that each doctor is permitted to study the line of work in which he is interested.

The outstanding characteristics of

medical mission work in China to-day are:

1. It offers a wide scope in almost every line of progress in technique and organization.

2. Those engaged are a happy group keenly interested in each other and in new lines of work.

3. All financial remuneration is on an extremely low scale.

Medical Society Notes

BILL ORTVED, Secy.-Treas.

The first event of the medical social year is a thing of the past. However, the Soph-Frosh dance held in the Royal York at the beginning of November more than measured up to the high standard maintained in all medical functions, and to the men at the head of this splendid party therefore go our hearty congratulations.

The lads in this faculty of ours are distinguishing themselves in other ways as well. On the football field the mighty Meds. machine clashes with the schoolmen in the interfaculty final. By the time you read this the event will be decided. However, the senior Meds' team is a strong one and win or lose they will be fighting to the end.

As regards the Medical-At-Home, much is being said and done, but as yet, Bill McGill, the man at the helm, is still issuing no definite announcement regarding the band for this occasion. However, from the size of the talk the choice will be a match for last year's.

Paul McGoey has obtained Dr. Ryerson for the first open meeting of the year which is to be held shortly. Dr. Ryerson plans to talk on "Health and Medical Education." This is a topic of prime importance at this time, and promises to be very interesting.

The Medical Society takes pleasure in announcing that Dr. Duncan Graham has graciously consented to accept the office of honorary secretary-treasurer for the coming year.

Due to the unfortunate sickness of Jack Mickles, the president of fourth year, it was found necessary to hold a by-election to secure a man to replace him. The society was indeed sorry to lose this man. However, Al. Mighton has been elected the new councillor for 4T1, and so everything is under control again.

Medical Athletics

M. P. TOWNSEND.
Secretary-Treasurer.

Since the last article was written a lot of water has passed under the bridge in athletic circles. The fall sports have, in most cases, been concluded or are entering the finals. It was with pangs of ill-concealed pleasure that we saw the Meds "crimson tide" show the Engineers how a good machine should run.

The Meds' team played well, their best game perhaps, and anything less than the best would have been insufficient against the stellar Junior School team with its sparkling backfield plays, easily traced to the "Stukus" generalship. However, it was early apparent that Earl Selkirk had not been wasting his time with the Meds' team as play after play was successful. McGoey's passes met with surprising success and Clinckett's punts were consistently long. McKone continued to make yards in his unobtrusive manner and deserves a good deal of credit for Meds' present position. However, it was in the line (that collection of forgotten men) that Meds have been superior throughout the season. It would be favoritism to pick out any one man, but Bolley can't be overlooked. For seeing him trundle up to the line is too

reminiscent of "Bunny" Wadsworth, to be passed over. At this point another forgotten man should gain recognition, Jack Epping, the hardworking manager, went to more trouble and expended more time and energy towards winning the "Cup" than any player.

Meanwhile our three volley-ball teams have been meeting with varying success, and it would appear at present that the "thirds" may be disqualified, because of an ineligible player. Let us hope that such an unfortunate incident may not happen again. The "seniors" are again "spiking" toward the championship, having lost only one game to date This year they hope to avenge themselves on "Dents" in the finals for last year's upset.

The soccer team has again entered the finals, this time against their old rivals "Victoria," and a newcomer to soccer playoffs, Wycliffe. Although hopes are high the competition will be very strong and the Meds will be lucky to take the cup from the perennial holders, Victoria.

Another pleasing showing was that made by the Junior Interfaculty swimming team when it placed second to "S. P.S." by only seven small points. The team proved particularly strong in the relays winning a first in the "two hundred" and a second in the "Medley," while Wadd won the only Meds individual first in the 200-yard breast-stroke. We hope to see these men out (and a lot more) for the senior meet, as our present position in ninth place in interfaculty competition is rather irksome.

Apparently our tennis tournament has been "snowed under" after reaching the third round and it has been decided to postpone it until spring. This tournament was a belated attempt to carry out the suggestion of last year's president for interfaculty competitions.

This year we have fond hopes of a good "boxing, wrestling and fencing" team. So far satisfactory wrestling turnout has resulted, but the other two departments are as yet pathetically weak. May we remind "first year" men that they can enter these events without loss of time as "P. T." credits are granted in all departments. For further particulars see Campbell of "second" for boxing, Gooderham, of "third" for fencing and McKenzie of "fourth" for wrestling.

In reading last Monday's "sportswoman" column (yes, we do read it) we were disappointed to see the prognostication of a Medette defeat at the hands of Household Science. However, this insult apparently spurred our "strong minority group" to greater efforts, as Tuesday's Varsity described their well-earned victory.

Abstracts

HAROLD COPP, Editor.

THE RESIDUAL INFECTIVITY OF THE PRIMARY COMPLEX OF TUBERCULOSIS.

By William H. Feldman *and* A. H. Baggenstoss—*A.J.P., July*, 1938.

An attempt was made to determine whether the lesions constituting the primary complex of tuberculosis ultimately heal, in the sense that foci no longer contain virulent organisms. Morphological criteria frequently suggest that the infectious agent in childhood tuberculosis persists for a long period of time. This question cannot be definitely settled until it is determined whether the material from the lesion is infectious for the guinea pig. The clinical significance of the problem lies in the fact that an apparently healed tuberculous focus within the body is always a menace as long as virulent tubercle bacilli are present.

In investigating this question, material was obtained from 68 bodies at autopsy. The ages ranged from 7 to 90 years and the cause of death was not tuberculosis in any case studied. The gross specimens consisted of encapsulated caseous or caseocalcareous Ghon tubercles or tracheobronchial lymph nodes. An attempt was made to use only tissue showing gross evidence of the lesion. Each sample was

emulsified, and with the material cultures were made, and guinea pigs inoculated. Most cases were examined histologically.

In only one case were the results positive. On the other hand in 46 cases studied histologically, 20 showed no evidence, 22 showed minimal evidence, and 4 showed definite histological evidence of activity. The lesions of the case in which bacilli were isolated showed only minimal evidence of being an active focus. Practically all the lesions contained silica but there was no correlation between the silica content and the evidence of activity.

The results seem to justify the assumption that lesions of the primary complex of tuberculosis when definitely encapsulated and sclerotic, or even caseous, seldom contained viable or virulent tubercle bacilli. Morphological findings are not indicative of the presence or absence of tubercle bacilli in such a focus and can possibly be explained by the presence of silica in nearly all cases. The data suggests that in adults endogenous reinfection is unlikely to occur from lesions of the primary complex. G.A.L.

THE MIGRAINE SYNDROME.

Clinic of Dr. Theodore J. C. Von Storch. *Boston City Hospital—Medical Clinics of North America. May*, 1938.

Migraine is not a disease, but a syndrome. It consists of recurrent severe headaches often attended by nausea, vomiting, and visual symptoms. The syndrome occurs against a background of well being but family history usually suggests a hereditary disposition.

Symptoms.

Symptoms in order of diagnostic importance are:—

(1) Recurrent headache, usually hemicranial, but may be alternating, bilateral or generalized.

(2) Visual disturbances consisting of blurring, dancing spots, eye pain, lacrimation and photophobia.

(3) Gastro-intestinal symptoms, usually nausea, vomiting, and abdominal pain. The diagnosis of abdominal migraine is dependent on a family history of migraine.

(4) History revealing the presence of migraine, epilepsy or allergy in the patient's immediate family.

Pathogenesis.

The migraine syndrome has been attributed to ocular, hepatic, gastric or duodenal disease, psychic maladjustment, endocrine disorders, cervical tension, autonomic imbalance, and other causes. Usually the syndrome has a multiple pathogenesis in which one or other cause is predominant.

Treatment.

Injection of ergotamine tartrate has terminated or aborted the migraine attack in 90 percent of 300 cases in the writer's experience. Results are most rapid and effective by parenteral injection of 0.25 to 0.50 mg. If the parenteral administration is successful try the drug orally, starting with 5 mg. by mouth followed by 2 mg. per hour if necessary until 11 mg. has been given. Not more than 1 mg. by injection, or 20 mg. by mouth should be given per week.

The drug is contraindicated in coronary, obliterative vascular, or hepatic disease, acute infection, and hypovitaminosis.

Ergotamine tartrate may cause nausea, numbness and tingling of the extremities, muscular pains, fatigue, and sternal oppression. These effects should not alarm the patient or physician. Simultaneous administration of atropine sulphate 1/120 gr. will relieve the gastric discomfort.

Calcium alone may decrease the frequency of attacks of migraine. In severe cases blood vessel operations may be needed. Psychologic readjustment, and treatment of the predominant pathology is recommended. J. G. W.

ONE HUNDRED BROKEN NOSES.

By J. W. Gerrie——*C.M.A.J., November*, 1938, *Vol.* 39, *No.* 5.

Etiology.—Eighty-three percent are in males and due to athletic or pugilistic endeavours.

Pathology.—Fractures are of two types:

(1) Lateral Impaction Fracture which is due to an oblique blow to the nose. This appeared in 85% of cases. There are three vertical and one horizontal fracture lines so that the segment on the side of the blow is forced under the portion on the opposite side, and impacted there There is slight oedema.

(2) Vertical or depressed fracture which is produced by a terrific head-on blow. The bone is fragmented.

Diagnosis.—Displacement, abnormal mobility, crepitus, internal haemorrhage, and X-ray aid in the diagnosis.

Reduction.—This is done at once under general anaesthesia, by two cotton-tipped haemostats, pushing outwards on the fragments. The septum is also straightened at the same time. Fixation is obtained by an internal double triangular rubber-covered wire splint. An external splint of plaster is provided for protection and to prevent local oedema. J. C. R.

RHEUMATIC FEVER.

By J. C. MEAKINS—*C.M.A.J., November, 1938, Vol. 39, No. 5.*

Many physicians associate tonsillitis with the onset of this disease when really tonsillitis is only a local manifestation of a pharyngitis. As the whole pharynx is involved, in many cases tonsillectomy may be useless as well as harmful. Kaiser showed that tonsillectomy did not influence recurrences but did lower mortality when done before the onset. To-day tonsillectomy is only done after the acute phase and when tonsils are diseased.

The disease is commoner in temperate climates, urban areas, poorer areas, in damp months, and runs in families. The usual age group is from six to twelve. In the younger decades the disease shows few arthritic symptoms but toxicity, severity of carditis, frequency of pericarditis, subcutaneous nodules, pulmonary and pleural lesions are the features. The child may even die from toxemia. In the older group the picture simulates rheumatoid arthritis although clinical and serological differences exist. J.C.R.

THE SIGNIFICANCE OF A LOW LEUCOCYTE COUNT IN ACUTE PYOGENIC INFECTIONS.

By C. H. WATSON *and* T. R. SARJEANT—*C. M. A.J., Nov., 1938, Vol. 39, No. 5.*

In acute infections the leucocyte count and the polymorphonuclear count (or Arneth count, which is high when the number of immature cells is increased) run parallel courses until suppuration occurs, after which the leucocyte count drops while the polymorphonuclear factor remains high or shows a further rise. The extent of the fall in the leucocyte count is determined by the size of the area involved in the suppurative process. In cases of pneumonia or appendictis a falling leucocyte count with a high or rising polymorph count indicates the onset of suppurative pleuritis or peritonitis. The low leucocyte count in acute pyogenic infections indicates massive localization of leucocytes in suppurating foci rather than failure of the leucopoietic function of the bone marrow. J. C. R.

TREATMENT OF SEVERE HYPERTHYROIDISM AND THE BAD RISK PATIENT.

By GEORGE CRILE, JR., M.D.—*Surg. Gyn and Obs., Nov., 1938, 67:661.*

This article discusses the management of cases at one of America's biggest thyroid clinics. Many of the methods described are similar to those used at the Toronto General Hospital.

Risk Factors.

There are four chief factors influencing the risk of thyroidectomy:

1. The condition of the heart.
2. The age of the patient.
3. The response of the pulse curve to pre-operative treatment.
4. The degree of extension of the goitre into the thorax.

The type of risk from each factor is discussed.

Preoperative Care.

There are five necessities in pre-operative care:

1. Diet—the food should be concentrated and high in carbohydrate and protein.
2. Sedatives—bromide and codeine are best.
3.—Iodine.
4.—Mental rest should be assured.
5. Digitalis should be given to patients with fibrillation, cardiac decompensation or signs of myocardial heart disease.

Operation is undertaken when a study of the pulse, weight, general appearance and B.M.R. indicate the most opportune time. The patient's own room, two stage operations using gas-oxygen analgesia and local novocaine are advocated. Iodine is given between the operations. In very severe cases ligation of the superior poles followed by X-ray to the thyroid is advocated.

In post-operative treatment the pre-operative iodine is continued. Oxygen tent, blood transfusion, intravenous glucose, cold water bottles, sufficient sedation, forced feeding are used. Each case requires its own application of these methods, which is discussed. J. C. McC.

THE SURGICAL TREATMENT OF HYPERTENSION.

By JOHN MARTIN, M.D., *Chicago, Illinois—Collective Review. Surg. Gyn. and Obs.; Int. Abstract of Surgery. Nov., 1938, p. 419.*

This article reviews the recent physiological findings related to essential hypertension. It discusses their application in surgery and what surgical treatment has already been attempted. A good Bibliography is appended.

Experimental.

Goldblatt found renal ischaemia produced essential hypertension in dogs. He considered this effect was not mediated by the vasomotor system, sympathetic, anterior roots or renal nerves. Bilateral adrenalectomy caused no hypertensive response to the renal experiment. Hypophysectomy reduced the pressure in Goldblatt's dogs with hypertension. Goldblatt postulated

a pressor substance developed in the ischaemic kidney producing hypertension.

Heymans found section of the depressor nerve to the heart and neurectomy of the carotid sheath produced hypertension and tachycardia of a "labile" type. Water and Pijvan produced a "labile" type of hypertension by nicking the posterior hypothalemus.

Spasticity of the arterioles due to dysfunction of the vasomotor nerves have been suggested as the cause of essential hypertension in the human subject.

Forms of Surgical Treatment.

1. Paroxysmal hypertension has been cured by removal of adrenal tumors.
2. Division of anterior nerve roots may be effective in reducing hypertension but is disabling.
3. De Courcy's bilateral partial adrenalectomy is the method of choice in adrenalectomy operations. De Courcy believes tissue must be removed, and denervation is not sufficient.
4. Sympathectomy:
   (a) Crile by a lumbar incision removes the coeliac ganglion and aortic nerves, so depressing the function of the "adreno-coeliac-aortic" complex.
   (b) Pende performs bilateral lower thoracic sympathectomy and removal of splanchnics. The endeavor is to diminish peripheral blood volume and adrenal function, and to stop vasoconstrictor effects on the kidney. Allen and Adson believe the brain and other organs are not unfavourably effected by these procedures.

J. C. McC.

THE SURGICAL TREATMENT OF OBSTRUCTIVE JAUNDICE IN PANCREATIC DISEASE.

By Sir John Fraser—*B.J.S, Oct.*, 1938.

This is a review of 1,038 cases of obstructive jaundice arising in relation to pancreatic disease. Analysis of the cases shows that males are affected twice as often as females, and that the peak age incidence is between 55 and 65 years, whether the pancreatic condition is simple or malignant. About 73% of cases were malignant and 24% simple, the remainder being unclassified. Distinction between benign and malignant is often difficult and even at operation the diagnosis cannot be made with certainty in many cases. The morbid anatomy diagnosis was wrong in 16.8% of cases.

Preoperative diagnosis was based on several factors.

Jaundice was a feature in every instance. Analysis showed that malignant disease was associated with more severe grades of jaundice than was the case with benign processes. The obstructive nature of the jaundice was diagnosed from history, physical condition and severity of the jaundice. The pancreatic origin of the obstruction was established by three factors. (a) The sequence of the history; (b) The incidence and character of the pain; (c) The state of the gall bladder on physical examination.

Special tests were done in many cases for confirmation or evaluation of the condition. (a) In the 578 cases tested, an immediate direct Van den Bergh was obtained in every one, offering confirmation of the obstructive nature of the jaundice. (b) An estimate of the degree of obstruction was obtained from the icteric index and serum bilirubin readings. (c) The degree of pancreatic involvement could be estimated from the increase in neutral fat in the stools. (d) Sugar tolerance and blood urea tests afforded an index of the effect of the obstruction on the vital functions. These tests are of assistance in arriving at a prognosis.

Operation is favoured in obstructive jaundice arising from pancreatic disease, the most popular operation being a cholecysto-gastrotomy. In malignant disease of the pancreas the mortality was 51.84%. A study of the survival period shows that 90% die within the first year, but that during life the great majority are free of pain, jaundice and pruritus. The mortality in chronic pancreatitis is 19.8%. Of the survivors 60% are alive one year after operation and are in relatively good health.

Two conclusions in particular support the argument that operation is the proper course to pursue in these cases.

1. Because of difficulties in diagnosis a simple case may be mistaken for a malignant one.
2. The survivors enjoy freedom from symptoms, a temporary relief only in malignant cases but more lasting in benign cases.

G. A. E.

THE ACTION OF EXCESS Na, Ca AND K. ON THE CORONARY VESSELS.

By L. N. Katz *and* E. Lindner—*Amer. Journ. of Physiol., Oct.* 1, 1938.

Method.

Denervated living coronary vessels in fibrillating dog hearts were perfused under constant pressure. Under these conditions changes in coronary inflow are in direct proportion to the calibre of the coronary vessels. Chloride salts of Na, Ca, and K. were injected into the coronary inflow tube.

Observations.

(1) Sodium and calcium produced a dilatation of the coronary vessels, the effect of the latter being longer in duration. These investigators suggest that the intravenous use of Ca. and Na. salts as coronary dilators merits further observation.

(2) Potassium in dilute concentrations produced a brief dilatation: stronger concentrations caused a lasting constriction, which approached complete coronary occlusion. Potassium salts used intravenously in large amounts would therefore be dangerous. In haemorrhage, shock and adrenal cortical insufficiency, a large rise in the blood potassium is observed. The circulatory failure present in these conditions may possibly be due to this rise in potassium which produces coronary occlusion, thereby causing heat failure.

R. L. M.

THE EFFECT OF DESTRUCTION OF THE SPINAL CORD ON THE ARTIFICIAL PRODUCTION OF HYPERTENSION IN DOGS.

By Frank Glenn *and* Earl P. Lasher—*Amer. Journ. of Physiol. Oct.* 1, 1938.

It had previously been shown that destruction of the cord below the level of C6 in animals with an established hypertension caused only a temporary fall in blood pressure. After a few weeks the pressure had regained a level almost as high as the hypertensive one. The above investigators studied the production of experimental hypertension in animals whose cord had already been destroyed below the level C6.

After the animals had recovered from shock and the blood pressure had returned to nearly normal, the renal arteries were gradually occluded. The blood pressure was found to rise to hypertensive levels, following the same course of development as in animals with intact cords.

The authors conclude that destruction of the part of the cord, below C6, which on the basis of clinical and experimental evidence maintains normal blood pressure, does not materially effect the development of hypertension in dogs. R. L. M.

HEREDITY IN DISEASE

By D. Beren, *and* V. Schetie—*Journ. of Paed.; Oct.*, 1938.

This is a well written review with complete references of the recent literature on Heredity in Disease. The authors point out three fields in which this problem is particularly important:

(1) The clinical significance to a physician in diagnosis and care of a specific case.

(2) Application to eugenic problems—a particularly controversial subject.

(3) Application to political and economic problems.

The review is limited for the most part to articles of clinical significance. The tendency in the literature to consider only cases with a positive history of heredity was criticized as over-emphasizing its importance in pathogenesis. The mistaken impression that nothing could be done for a patient with a hereditary disease was deplored. The value was stressed of bringing into operation environmental factors to overcome the hereditary factors which are obviously beyond control. A. S.

OCCLUSION OF THE ENTIRE INFERIOR VENA CAVA.

By A. L. Sparks, M.D. *and* Herbert Fox, M.D., *Cleveland—Arch. of Path., Vol.* 26, *Aug.*, 1938.

This paper presents a case of long-standing complete occlusion of the entire subdiaphragmatic portion of the inferior vena cava. The case is remarkable for the extent of the collateral circulation established. Progressive cirrhosis of the liver resulted in partial occlusion of the portal vein. The co-existence of portal obstruction (partial) and complete occlusion of the inferior vena cava presented a baffling clinical problem.

The inferior vena cava from below the hepatic veins to the common iliac veins was completely occluded and transformed into a fibrous cord. The renal veins were obliterated for a distance of 2 to 3 cm. in direct continuity with the vena cava. There was no recanalization of the vena cava.

The collateral circulation consisted of communications between the inferior caval tributaries and the portal, azygos, internal mammary and inferior phrenic veins. The left adrenal vein was greatly dilated and communicated with the left splenic and left inferior phrenic veins. The right adrenal vein anastomosed with the right inferior phrenic vein. There were many communications between the ovarian veins and the mesenteric veins. Branches of the internal mammary veins were in communication with many branches of the external iliac veins. The omentum, which was adherent to the abdominal wall, possessed many dilated veins which were apparently in direct communication with similar dilated veins in the anterior abdominal wall. Greatly dilated ascending lumbar veins emptied into the azygos vein and formed an important channel of venous return. The most important communications were those between the inferior caval tributaries and the branches of the portal vein. The cirrhosis of the liver interfered with this collateral circulation and considerably hastened death. J. G. W.

NEW AND SIMPLE METHOD FOR THE DETECTION OF BLOOD BY HEATING.

By A. M. Moody, M.D., Frederick Proescher, M.D., *and* Jesse L. Carr, M.D.—*Arch. of Path., Vol.* 26, *Aug.*, 1938.

The authors were asked to find out for medicolegal purposes if blood could be identified after it had been incinerated.

Pure blood and blood mixed with organic or inorganic material were heated from 212F. (100 C.) to 1,600F. (871 C.).

They were surprised to observe distinctive and characteristic changes in the samples after the blood was heated to 500F. (260 C.). Such proved one of the best means of identifying blood, and the approximate temperature to which it was heated was physically evident.

The changes occurring in blood with heating are:

At 392 F. the precipitin test is lost.

At 500 F. dried blood boils, forms a glairy-like bubble with a shiny refractile surface.

At 600 F. gases escape, further bubbling occurs and the blood turns black.

At 700 F. the blood mass shrinks back into the crucible and is black and finely crystalline. Microscopically a definite pattern suggesting pentagonal pyrrole rings is seen. The spaces between the rings are filled with a brownish-yellow translucent membrane.

At 800 F. the gross appearance is fine and mossy. Microscopically the rings are still present but the membrane has disappeared leaving only fluffy red masses.

At 900 F. a dull, grayish-black mass is left. Microscopically four and five-sided very fine figures resembling wire models used in teaching molecular structure remain.

At 1000 F. there is a finely granular red powder only 1/50 the maximal volume, in which the microscopic figures are breaking up.

At 1200 F. the residue is of very fine texture and none of the microscopic figures remain. This is the final stage.

These changes are specific for blood, and the characteristic structures develop even when the blood is mixed with chlorophyll, egg-white, egg-yolk, vegetables, grasses or inorganic substances, and are easily identified even when only 1 mg. of blood is present. It does not distinguish human from other blood. J. G. W.

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Book Review

THE HEALING KNIFE OR A SURGEON'S DESTINY.

By George Sava.

George Sava is the pseudonym used by a Harley Street specialist in this autobiography of a refugee of the Russian revolution. Sickened by useless slaughter, and glowing with the success of a jack-knife operation performed on the field of battle, for the removal of a bullet pressing against the pericardium, the author resolves, "to become the modern helper of the poor and suffering—a surgeon."

Originally of a titled, wealthy, and respected Russian family, he loses all his material possessions, as well as his friends, following the unsuccessful stand of the White Army, in which he served as a naval lieutenant. His determination to become a surgeon carries him through many vicissitudes: an Italian prison; a Turkish conspiracy for the establishment of Kemal Pasha; a position as stoker at the University of Sofia, where he learned anatomy and histology by secret nocturnal dissections; a hitch-hiking trip across Europe, from Sofia to Paris, on the buffers of railway cars; positions as waiter in various restaurants; an unfortunate love affair which destroyed his trust in women; and a haemorrhaging gastric ulcer following a three-day period of starvation.

Interspersed with these trials he describes his triumphs: his winning, while studying at Florence, of one of three Mussolini scholarships in medicine, from a field of over four hundred; his ability to make personal friends of his professors; the several cases in which his appeal for operation, when all had given up hope, resulted in miraculous cures. He states his position in regard to sterilization, which he favours, and voluntary euthanasia, which, after some involved soul-searching, he opposes, using concrete cases to illustrate his viewpoint. In fact the author makes frequent use of the dramatised case history as a means of illustrating and emphasizing the various phases of his career.

Before commencing the study of medicine, an experience in an English Asiatic hospital so impressed him that his ultimate ambition became the attainment of a staff appointment to an English hospital. After years of heart-breaking struggles and gratifying victories he leaves himself on the staff of a German hospital, with the hint that in another volume he will tell how he eventually reached Harley Street.

The book is written in the first person, and like many autobiographies, is concerned wholly with the doings, thoughts and philosophy of the author. The style is meticulous but is not fluent. Many of the words, phrases and ideas are somewhat stilted. This impression is enhanced by the fact that the author reveals in himself the complete lack of anything approaching a sense of humor. He takes himself, his work, and his experiences with the utmost seriousness, and never appears to realize that he is quite ridiculous at times. He is tremendously impressed with the glorious mission of the medical profession in general, and the surgeons in particular. He is amazed to discover that the cry of the critically ill patient sometimes transcends in importance the man-made legal code.

This book may be of interest to the general public (all technical terms being defined in parenthesis); and certainly it presents that side of the story which was so completely overlooked by A. J. Cronin in "The Citadel." It should also be of some interest to medical students as it shows the type of education in vogue in Europe in the years immediately following the war. But as an autobiography of a famous surgeon it makes duller reading than many similar volumes which have appeared on the publishers' bookshelves during the past few years.